

# **1996 Fare-Mix Study**

## **MBTA Heavy Rail, Light Rail, Bus, and Commuter Rail Service: Average Fares and Ridership**

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## Table of Contents

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<b>LIST OF FIGURES, BOXES AND TABLES .....</b>	<b>v</b>
<b>1. INTRODUCTION AND SUMMARY OF RESULTS .....</b>	<b>1</b>
INTRODUCTION .....	1
SUMMARY OF RESULTS .....	2
Average Fares .....	2
Revenue.....	4
Ridership .....	5
<b>2. DESCRIPTION OF MBTA SERVICE AND RIDERSHIP CLASSIFICATION.....</b>	<b>8</b>
DESCRIPTION OF SERVICE .....	8
Heavy and Light Rail .....	8
Bus and Trackless Trolley .....	11
Commuter Rail .....	11
RIDERSHIP CLASSIFICATION.....	12
Heavy and Light Rail .....	12
Bus and Trackless Trolley .....	13
Commuter Rail .....	13
<b>3. MBTA FARE STRUCTURE.....</b>	<b>14</b>
CASH FARES.....	14
Adult Fares .....	14
Special Fares .....	16
PASS FARES.....	16
<b>4. METHODS OF STATISTICAL ANALYSIS .....</b>	<b>20</b>

<b>5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS.....</b>	<b>26</b>
HEAVY RAIL.....	26
Sample Design.....	27
Survey Procedure.....	28
Survey Coding, Processing, and Sample Results.....	30
Fare Category Proportions and Average Fares .....	33
LIGHT RAIL.....	36
Sample Design.....	37
Survey Team Shift Schedules.....	37
Survey Procedure.....	38
Fare Categories .....	40
Survey Coding and Processing.....	40
Estimation of Fare Evasion Rate .....	41
Fare Category Proportions and Average Fares .....	41
BUS AND TRACKLESS TROLLEY.....	44
Sample Design.....	45
Survey Procedure.....	46
Survey Coding and Processing.....	46
Fare Category Proportions.....	47
Farebox Revenue on Sampled Trips .....	48
Average Fares .....	49
COMMUTER RAIL.....	50
Methods of Fare Payment .....	50
Information Sources for Fare Revenue.....	50
Method of Ridership and Fare-Mix Calculation.....	51
Fare Category Proportions and Average Fares .....	56
REVENUE FIGURES AND ESTIMATION OF RIDERSHIP.....	58

## **APPENDICES**

APPENDIX A: SURVEY FORMS AND SAMPLE LISTS/SCHEDULES

APPENDIX B: SAMPLE RECORDS AND STATISTICAL CALCULATIONS

APPENDIX C: FURTHER STATISTICAL ISSUES

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## List of Figures, Boxes and Tables

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### FIGURES

2-1	Rapid Transit and Surface Green Line Map, Fare Zones and Adult Cash Fare .....	9
-----	---	---

### BOXES

4-1	Example of Fare-Mix Calculation with Simplified Figures .....	22
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### TABLES

1-1	Average Farebox Deposit, True Average Fare and Average Pass Ride Value by Mode for Weekdays and the Weekend Combined .....	3
1-2	Average Farebox Deposit by Mode for Weekdays and the Weekend .....	4
1-3	Weekly Revenue from the Farebox and Pass Sales by Mode .....	5
1-4	Weekly Passenger Boardings by Mode .....	6
1-5	Weekly Passenger Boardings in Spring 1996 by Fare Category .....	7
3-1	Rapid Transit and Bus Adult Cash Fares .....	15
3-2	Rapid Transit and Bus Pass Fares .....	17
3-3	Commuter Rail Fares .....	19
5-1	Rapid Transit, Subway Green Line and Heavy Rail Turnstile Fare Category Proportions .....	30
5-2	Rapid Transit, Subway Green Line and Heavy Rail Turnstile Average Farebox Deposit .....	31
5-3	Rapid Transit, Subway Green Line and Heavy Rail Collector's Turnstile Fare Category Proportions .....	32
5-4	Rapid Transit, Subway Green Line and Heavy Rail Collector's Turnstile Average Farebox Deposit .....	33
5-5	Rapid Transit, Subway Green Line and Heavy Rail Fare Category Proportions .....	34

5-6	Rapid Transit, Subway Green Line and Heavy Rail Average Fares .....	35
5-7	Surface Green Line Average Fares.....	42
5-8	Surface Green Line and Light Rail Round-Trip Fare Category Proportions.....	43
5-9	Surface Green Line and Light Rail Round-Trip Average Fares .....	44
5-10	Bus and Trackless Trolley Fare Category Proportions .....	47
5-11	Bus and Trackless Trolley Average Fares.....	49
5-12	Commuter Rail Fare Category Proportions .....	56
5-13	Commuter Rail Average Fare.....	57
5-14	Weekly Passenger Boardings and Revenue by Mode.....	59

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# 1. Introduction and Summary of Results

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## INTRODUCTION

Since 1981, the MBTA has estimated rapid transit, surface Green Line and bus/trackless trolley ridership levels by dividing the fare revenue collected on each mode by the average fare paid by riders. Total fare revenue by mode is calculated on an ongoing basis by the MBTA's Revenue Audit Department, while average fares are determined through periodic "fare-mix" studies.<sup>1</sup> In this study, a portion of MBTA ridership is sampled for each mode to determine the proportions of passengers paying the various types of fares. These proportions are then used in conjunction with fare levels to calculate average fares.

This fare-mix report documents the procedures and results of fare-mix surveys conducted in the spring of 1996. The average fares calculated herein will also be used by the MBTA as the basis for generating monthly revenue-based ridership estimates until the next fare-mix analysis.

This fare-mix study introduces a few changes compared to earlier studies. Until now, the MBTA system was divided into rapid transit (Red, Orange, Blue and the subway Green Line), surface Green Line, bus/trackless trolley and commuter rail. In this report, modes will be defined as they are in Section 15 reporting: heavy rail (Red, Orange, Blue), light rail (all Green Line plus Mattapan Trolley), bus/trackless trolley and commuter rail. However, in this study, both the new and the old modal divisions will be reported to allow for comparison. Additionally, instead of the "Average Cash & Token Fare," which is not calculated anymore, two new figures are estimated in order to take into account monthly pass usage: true average fare and average pass ride value.

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<sup>1</sup>Prior fare-mix studies were conducted in 1981, 1982, 1983, 1984, 1985 (CTPS Technical Reports 39, 43, 48, 55 and 57), 1989 (1989 MBTA Fare-Mix Study) and 1992 (1992 MBTA Fare-Mix Study).

## SUMMARY OF RESULTS

Between 1992 and 1996, weekly passenger boardings decreased on the bus system, stayed relatively stable on rapid transit and the surface Green Line and increased on commuter rail, resulting in a slight decline in ridership for the system as a whole. The average farebox deposit rose on rapid transit and the surface Green Line but dropped on commuter rail and the bus system. Systemwide revenue rose between 1992 and 1996, and increased on every mode except bus.

### Average Fares

Table 1-1 exhibits average farebox deposit, true average fare and average pass ride value for weekdays and the weekend combined, and Table 1-2 shows the average farebox deposit for weekdays and the weekend separately. Average farebox deposit is the ratio of farebox revenue to all passengers, including those using a monthly pass. The true average fare is the ratio of all revenue, including pass revenue, to all passengers. (True average fare is not available for weekdays and weekends separately because of the lack of detailed revenue data.) The average pass ride value is the ratio of pass revenue to total trips for which a pass was used.

The 1996 values are compared to the 1992 *Fare-Mix Study* results ("April 1992") and to the results generated by Peter G. Furth<sup>2</sup> ("Furth Analysis 1992"). For rapid transit, 1992 *Fare-Mix Study* figures were not weighted. Thus, in the 1996 analysis, both an unweighted figure (for reasons of comparison to 1992) and a figure weighted by the total numbers of heavy rail and light rail passengers (i.e., subway Green Line) were computed. There is virtually no difference between the unweighted and weighted results with the exception that the weighted figures have a better precision.

From 1992 to 1996, the average farebox deposit for rapid transit increased on weekdays and decreased slightly on the weekend, resulting in an overall increase. The average fare for the Green Line increased slightly in this time period, reflecting a small increase in the weekday average fare. For the bus system, the average farebox deposit decreased, because more passengers used a pass. The same trend is visible for commuter rail between 1993 and 1996. For the whole system without commuter rail (also known as the core system), the average farebox deposit increased by 4.3% over the last four years. In 1996, the systemwide average fare, including commuter rail, was \$0.766.

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<sup>2</sup>Published in the MBTA *Supplemental Draft Environmental Impact Report on the 1991 Fare Increase*.



**Table 1-1**  
**Average Farebox Deposit, True Average Fare and Average Pass Ride Value**  
**by Mode for Weekdays and the Weekend Combined in Dollars**

	<u>Spring 1996</u>	<u>April 1992</u>	<u>Furth Analysis 1992</u>
<b>Rapid Transit</b>			
Avg. Farebox Dep. (unwght.)	0.478 (10.9%)	0.432	0.444 (12.8%)
Avg. Farebox Dep. (wght.)	0.477 (10.6%)	—	
<b>Heavy Rail System</b>			
Average Farebox Deposit	0.463 (12.4%)	—	—
True Average Fare	0.815	—	
Average Pass Ride Value	0.828	—	
<b>Surface Green Line</b>			
Average Farebox Deposit	0.322 (4.5%)	0.312	—
<b>Light Rail System</b>			
Average Farebox Deposit	0.413 (7.0%)	—	—
True Average Fare	0.602	—	
Average Pass Ride Value	0.691 <sup>3</sup>	—	
<b>Bus</b>			
Average Farebox Deposit	0.249 (10.4%)	0.263	0.263 (4.6%)
True Average Fare	0.445	—	
Average Pass Ride Value	0.489	—	
<b>Core System</b>			
Average Farebox Deposit	0.361	0.346	—
True Average Fare	0.612	—	
Average Pass Ride Value	0.639	—	
<b>Commuter Rail System</b>			
Average Farebox Deposit	1.062	1.081 <sup>4</sup>	—
True Average Fare	2.386	2.161	
Average Pass Ride Value	1.899	1.825	
<b>Total System</b>			
True Average Fare	0.766	—	—

(Note: Numbers in parentheses are the precision figures at the 95% confidence level.)

<sup>3</sup>This figure excludes free outbound surface stop trips.

<sup>4</sup>This figure is for 1993, since the equivalent commuter rail data are not available for 1992.

**Table 1-2**  
**Average Farebox Deposit by Mode for Weekdays and the Weekend in Dollars**

	<u>Spring 1996</u>	<u>April 1992</u>	<u>Furth Analysis 1992</u>
<b><u>Weekday:</u> Rapid Transit</b>			
unweighted	0.481 (12.5%)	0.421	0.437 (14.6%)
weighted	0.481 (11.9%)		
<b>Heavy Rail System</b>	0.464 (14.1%)	—	—
<b>Surface Green Line</b>	0.307 (5.2%)	0.298	0.289 (7.3%)
<b>Light Rail System</b>	0.412 (7.9%)	—	—
<b>Bus</b>	0.249 (12.1%)	0.261	0.261 (4.8%)
<b>Commuter Rail</b>	0.921	0.948 <sup>5</sup>	—
<b><u>Weekend:</u> Rapid Transit</b>			
unweighted	0.460 (12.0%)	0.503	0.508 (18.8%)
weighted	0.460 (12.0%)		
<b>Heavy Rail System</b>	0.460 (11.0%)	—	—
<b>Surface Green Line</b>	0.380 (8.8%)	0.384	—
<b>Light Rail System</b>	0.415 (14.3%)	—	—
<b>Bus</b>	0.253 (19.1%)	0.277	0.277 (17.6%)
<b>Commuter Rail</b>	2.398	2.429 <sup>5</sup>	—

(Note: Numbers in parentheses are the precision figures at the 95% confidence level.)

### **Revenue**

Weekly revenue figures are given in Table 1-3. Total revenue for the core system (the whole system, except commuter rail), including both farebox revenue and pass revenue, was 11% higher in 1996 than in 1992. The farebox revenue increased by only 3.2%, but the pass sales revenue rose by 24.6%. In 1996, pass revenue accounted for 41% of total revenue.

<sup>5</sup>This figure is for 1993, since the equivalent commuter rail data are not available for 1992.

**Table 1-3**  
**Weekly Revenue from the Farebox and Pass Sales by Mode**

	<u>Spring 1996</u>	<u>April 1992</u>
<b>Rapid Transit</b>		
Farebox Revenue	\$986,595	\$894,409
<b>Heavy Rail System</b>		
Farebox Revenue	\$769,100	—
Pass Sales Revenue	\$583,014	—
<b>Surface Green Line</b>		
Farebox Revenue	\$174,079	\$166,018
<b>Light Rail System</b>		
Farebox Revenue	\$391,574	—
Pass Sales Revenue	\$179,347	—
<b>Bus</b>		
Farebox Revenue	\$461,682	\$512,160
Pass Sales Revenue	\$363,485	—
<b>Core System</b>	\$2,748,202	\$2,476,187
Farebox Revenue	\$1,622,356	\$1,572,587
Pass Sales Revenue	\$1,125,846	\$903,600
<b>Commuter Rail</b>	\$1,018,994	\$865,983 <sup>6</sup>
Farebox Revenue	\$453,506	\$433,264 <sup>6</sup>
Pass Sales Revenue	\$565,488	\$432,719 <sup>6</sup>
<b>Total System</b>	\$3,767,196	—

### Ridership

Table 1-4 shows the number of weekly passenger boardings by mode, and Table 1-5 breaks down the 1996 boardings by fare category. Altogether, in 1996 the MBTA had over 4.9 million weekly boardings. Between 1992 and 1996, total boardings for the core system were essentially unchanged. Rapid transit boardings increased by 2.6%, while the surface Green Line stayed stable. The

<sup>6</sup>This figure is for 1993, since the equivalent commuter rail data are not available for 1992.

**Table 1-4**  
**Weekly Passenger Boardings by Mode**

	<b>Spring 1996</b>	<b>April 1992<sup>7</sup></b>
<b>Rapid Transit</b>		
Unweighted	2,064,196	2,069,764
Weighted	2,067,637	2,014,435 <sup>8</sup>
<b>Heavy Rail System</b>	1,659,533	—
<b>Surface Green Line</b>	539,995	531,473
<b>Mattapan High Speed Line</b>	30,500 <sup>9</sup>	—
<b>Light Rail System</b>	978,599	—
<b>Bus</b>	1,853,128	1,950,806
<b>Core System</b>	4,491,260	—
Excl. Mattapan	4,460,760	4,496,714 <sup>10</sup>
<b>Commuter Rail</b>	427,133	400,760 <sup>11</sup>
<b>Total System</b>	4,918,393	—
Excl. Mattapan HSL	4,887,893	—

bus system exhibited a significant drop (5%), continuing a long-standing trend of declining ridership. Total commuter rail boardings, however, increased from 1993 to 1996 by 6.6%. In 1996, the bus system moved the most passengers (1.85 million per week), followed by heavy rail (1.66 million per week), light rail (0.98 million per week) and commuter rail (0.43 million per week). In 1996, most passengers on the core system paid adult cash fares (43.8%) and 39.5% of the riders used a monthly pass. The monthly pass was the most common fare category on commuter rail (60.2%), the surface Green Line (32.6%) and bus system (40.1%).

<sup>7</sup>All 1992 passenger boarding figures exclude Mattapan High Speed Line.

<sup>8</sup>Derived from P. Furth's 1992 average farebox deposit figure, which corrected for the error causing rapid transit ridership in the 1992 Fare-Mix Study to be too high (see pp. 33-34).

<sup>9</sup>The Mattapan High Speed Line figure is based on a 1995 passenger count.

<sup>10</sup>This figure is the sum of bus, surface Green Line and the weighted value for rapid transit.

<sup>11</sup>This figure is for 1993, since the equivalent commuter rail data are not available for 1992.

**Table 1-5**  
**Weekly Passenger Boardings in Spring 1996 by Fare Category by Mode (without Mattapan HSL)<sup>12</sup>**

	<u>Passenger Boardings</u>	<u>Adult Cash</u>	<u>Adult Pass</u>	<u>Sen. Cit. &amp; Disabled</u>	<u>Child Half</u>	<u>Stud. Pass</u>	<u>Free</u>	<u>Other</u>
RT Weighted	2,067,637	1,072,071 (51.9%)	840,494 (40.7%)	72,367 (3.5%)	26,879 (1.3%)	33,082 (1.6%)	22,744 (1.1%)	—
Surface Green Line	539,995	163,417 (30.3%)	175,857 (32.6%)	21,600 (4.0%)	5,400 (1.0%)	6,480 (1.2%)	166,117 (30.8%)	1,014 (0.2%)
Heavy Rail System	1,659,533	819,809 (49.4%)	705,302 (42.5%)	64,722 (3.9%)	21,574 (1.3%)	31,531 (1.9%)	16,595 (1.0%)	—
Light Rail System	948,099	416,758 (44.0%)	312,467 (33.0%)	29,391 (3.1%)	9,481 (1.0%)	7,585 (0.8%)	171,403 (18.1%)	1,014 (0.1%)
Bus System	1,853,128	719,014 (38.8%)	743,104 (40.1%)	127,866 (6.9%)	75,978 (4.1%)	107,481 (5.8%)	79,685 (4.3%)	—
Core System	4,460,760	1,955,581 (43.8%)	1,760,873 (39.5%)	221,979 (5.0%)	107,033 (2.4%)	146,597 (3.3%)	267,683 (6.0%)	1,014 (0.0%)
Commuter Rail	427,133	148,642 (34.8%)	257,134 (60.2%)	12,814 (3.0%)	5,126 (1.2%)	—	3,417 (0.8%)	—

<sup>12</sup> Numbers might not add up do to rounding.

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## 2. Description of MBTA Service and Ridership Classification

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The MBTA operates a system of five rapid transit and light rail lines, 11 commuter rail lines, 159 bus routes, and four trackless trolley routes. The MBTA also provides for the operation of three commuter boat routes. Specialized accessible transportation is provided in 51 cities and towns, and the MBTA subsidizes private bus service provided by seven companies and suburban bus service operated in 10 towns.

This study focuses on ridership on the MBTA's rapid transit, surface Green Line, bus/trackless trolley, and commuter rail services.<sup>12</sup> These services, and the classifications of riders on these services, are described below.

### DESCRIPTION OF SERVICE

#### Heavy and Light Rail

The MBTA heavy and light rail system is comprised of five lines, including 60 stations and 65 surface stops: the Red Line, the Orange Line, the Blue Line, the Green Line, and the Mattapan High Speed Line (see Figure 2-1).

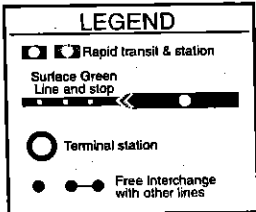
Red Line: The Red Line is 20.5 miles long. There are twenty-two stations on the Red Line, 16 of which are accessible for persons with disabilities. There are two branches, with service running between Alewife Station in North Cambridge and Ashmont Station in Dorchester or Braintree Station in Braintree. All service operates along a common alignment between Alewife and the JFK/UMass Station in Dorchester, at which point service branches off to either Ashmont or Braintree. Throughout most of the day, service is split equally between the two branches.

For fare purposes, most of the Red Line is in Zone 1. The exceptions are Quincy Center, which is in Zone 2, and Quincy Adams and Braintree, which are in Zone 3. Riders entering Zone 2 and 3 stations pay twice the base fare

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<sup>12</sup>Ridership data for the commuter boat lines are generated from other sources.

### Figure 2-1



FROM/TO	Zone 1	Zone 2	Zone 3	Zone A	Zone B	Zone C	Zone D
<b>Zone 1</b>	85¢	85¢	\$1.70	85¢	85¢	85¢	85¢
<b>Zone 2</b>	\$1.70*	----	85¢	\$1.70	\$1.70	\$1.70	\$1.70
<b>Zone 3</b>	\$1.70*	85¢	85¢	\$1.70	\$1.70	\$1.70	\$1.70
<b>Zone A</b>	85¢	85¢	85¢	85¢/free**	85¢	85¢	85¢
<b>Zone B</b>	\$1.00	\$1.00	\$1.85	\$1.00	\$1.00/free**	free	\$1.00
<b>Zone C</b>	\$2.00	\$2.00	2.85	\$2.00	\$2.00	\$1.00/free**	\$2.00
<b>Zone D</b>	85¢	85¢	\$1.70	85¢	85¢	85¢	60¢/free***

- \* EXCEPT 85¢ TO WOLLASTON AND N. QUINCY
- \*\* INBOUND/OUTBOUND
- \*\*\* 60¢ INBOUND (EXCEPT FREE TO ASHMONT), FREE OUTBOUND.

(base fare is \$0.85), and riders exiting Zone 3 stations also pay an additional base fare. A warrant (good for an \$0.85 rebate and/or a free exit) is given to those riders who enter Zone 2 and exit in Zone 3 or vice versa. Commuter rail connects to the Red Line at two stations: Porter Square and South Station.

Orange Line: The Orange Line is 11 miles long and operates between Oak Grove in Malden and Forest Hills in Jamaica Plain. There are 19 stations, 13 of which are accessible for persons with disabilities. The Orange Line includes Boston's newest section of subway—the 4.9 mile section between Forest Hills and Chinatown—which opened in 1987.

All of the Orange Line is in Zone 1 and the base "subway" fare is charged for all trips. Much of the Orange line shares the right-of-way with commuter rail, in the Southwest corridor and along the Haverhill/Reading Line. Connections can be made with commuter rail at North Station and Malden Center on the north side, along with Back Bay/South End, Ruggles and Forest Hills on the south side.

Blue Line: The Blue Line is the shortest of the four subway lines (six miles) and operates between Wonderland Station in Revere and Bowdoin Station in Boston. There are 12 stations, 6 of which are accessible for persons with disabilities. Bowdoin Station, the southern terminus point (just past the Government Center stop), operates only until 5:30 PM Monday through Friday, and is closed on weekends. When Bowdoin is closed, service terminates at Government Center. All the Blue Line is in Zone 1 and the base "subway" fare is charged for all trips. There are no connections with the commuter rail on the Blue Line.

Green Line: The Green Line is the oldest subway line in America and at 25.5 miles, is the longest in total length of the system. It is comprised of three parts; a subway, an elevated, and a surface section and is the most heavily used line in the system. Just a few of the 13 subway stations and the 57 surface stops yet provide access for persons with disabilities. The Green Line has four branches to the west and southwest of downtown Boston: the Boston College branch (B Line), the Cleveland Circle branch (C Line), the Riverside branch (D Line) and the Heath Street branch (E Line). All branches operate to their named terminals. The northern terminus of the Green Line is at Lechmere station in Cambridge, but only Heath Street trains operate that far. Ridership north of downtown Boston is much lower than to the west and southwest, and because of that, Cleveland Circle trains end at North Station, and Boston College and Riverside trains turn around at Government Center.<sup>13</sup>

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<sup>13</sup>Construction at North Station, begun in March 1997, has changed the operations of the Green Line branches from the pattern observed during the data collection efforts.



## 2. DESCRIPTION OF MBTA SERVICE AND RIDERSHIP CLASSIFICATION

The Central Subway portion of the Green Line (Lechmere-Kenmore/Symphony) is in Zone 1 and the base "subway" fare is charged for all trips. The surface Green Line, which has its own fare structure (described in detail in Chapter 3), currently ranges from free (for outbound surface trips) to \$2.00 (Riverside-Chestnut Hill inbound).

On the Green Line, North Station is the only station that connects directly with commuter rail. However, Copley station is only two short blocks from the Back Bay/South End commuter rail station.

**Mattapan High Speed Line:** The Mattapan High Speed Line operates between Ashmont and Mattapan using PCC light rail vehicles. Although the line is considered an extension of the Red Line in many respects, its vehicles are maintained and operated as part of the Green Line fleet. The line is 2.55 miles long, has eight surface stops, and all outbound travel is free. Passengers who take inbound trips are charged a fare of \$0.60 only upon exiting prior to Ashmont. It is assumed that passengers who get off at Ashmont will continue traveling on the Red Line (or get on a bus) and pay the boarding fare there. There are no connections with the commuter rail on the Mattapan High Speed Line.

### **Bus and Trackless Trolley**

The MBTA operates 159 bus routes throughout the MBTA district. There are also four trackless trolley routes serving Cambridge, Watertown and Belmont. Nearly all routes connect with the rapid transit system at least at one location. In areas closer to Boston, bus service generally fills gaps in the rapid transit system (including cross-town service), provides feeder service to rapid transit stations, and provides line haul service in heavily congested areas. Further out, buses provide local service, connections to the rapid transit system, and express service to downtown Boston.

Most bus trips cost only \$0.60 (one or two zones). A few routes that cross Route 128 (I-95) have three zones and charge an extra \$0.40 for passengers traveling across the highway. Six routes on the North Shore (426, 436, 440/441/442, 450, 400/455 and 468) are zoned-local/express combination routes, and the longer runs require more than \$1.00. Express service is considered to be premium service with fares of \$1.50 to \$2.25.

### **Commuter Rail**

MBTA commuter rail is made up of 11 lines and 102 stations, of which 52 stations are accessible. In total, the network is 288 miles long. The commuter

rail system is split into two sides. The Massachusetts Turnpike can be considered the dividing line between north and south side service.

All north side trips originate from or terminate at North Station, which is served by five lines and 54 stations. Connections can be made to rapid transit at three stations; Porter Square (Red Line), Malden Center (Orange Line) and North Station (Green and Orange Lines). All lines have weekend service at a lower level than weekdays, with the exception of the Ipswich branch which does not run on Sundays.

All south side trips originate from or terminate at South Station, which is served by six lines and 48 stations. In addition, all south side lines except the Fairmount line serve Back Bay Station. On the south side, commuter rail connects with four rapid transit stations: South Station (Red Line) and Back Bay, Ruggles and Forest Hills (Orange Line). On the weekend, only the Franklin line is fully served, the Worcester line runs only to Framingham, and the Attleboro line does not go to Providence, R.I. The Needham line is served only on Saturday, and the Fairmount and Stoughton lines do not have any service on the weekend.

## **RIDERSHIP CLASSIFICATIONS**

### **Heavy and Light Rail**

The Red, Orange and Blue Line are classified as the heavy rail system, while the Green Line and the Mattapan High Speed Line are considered the light rail system. Previous fare-mix studies, such as the one from 1992, distinguish between "rapid transit", including the subway section of the Green Line between Lechmere and Kenmore/Symphony, and "surface Green Line" consisting of the Green Line portion beyond Kenmore and Symphony.

Riders are classified as heavy rail or light rail riders based upon where they enter the system. Those entering the heavy rail portion of the system are classified as heavy rail riders regardless of whether they exit at heavy rail or light rail stations. Conversely, passengers boarding at light rail stops are classified as light rail riders, no matter where they exit.

The fare-mix procedure samples riders at the time that they enter the heavy rail and light rail system and does not track passenger movements within the system. Therefore, figures in this report do not include transfers as separate unlinked trips. At the same time, the figures do not represent complete linked trips because it is not known how many of the trips include transfers to and from the bus system. The rail figures in this report should most accurately be considered simply the number of entries into the heavy rail and light rail systems.

## 2. DESCRIPTION OF MBTA SERVICE AND RIDERSHIP CLASSIFICATION

Even though the Green Line was analyzed as part of the light rail system, for data collection purposes, the subway portion was sampled together with the heavy rail system and in the tables is referred to as "Subway Green Line" or "Subw. GL". All heavy rail and subway Green Line stations together are called "Rapid Transit" or "RT".

### **Bus and Trackless Trolley**

For sampling purposes, no distinction was made between local and express bus routes, since revenue is not reported separately, or trackless trolley, since it operates in the same manner using the same fare structure. Average fares, and ridership figures are therefore combined results for all routes and different services.

### **Commuter Rail**

Information on commuter rail ridership was partly derived from a passenger survey and tickets sale figures. This report presents data on average fares, the fare-mix and the number of boardings in a manner similar to rapid transit, surface Green Line and bus. More detailed information is available in a separate CTPS report, the *1993 MBTA Commuter Rail Survey* (March 1995).

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### 3. MBTA Fare Structure

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#### CASH FARES

##### Adult Fares

The MBTA fare structure is a zone system consisting of a large central zone, and smaller outer zones that differ with each mode of travel. In addition, base and zone fares differ with each mode (see Table 3-1).

Heavy Rail: The heavy rail system is divided into three fare zones (see Figure 2-1). The majority of stations are in Zone 1, which extends eight miles from the core of downtown Boston. For trips within Zone 1, the one-way fare is \$0.85. Currently only Quincy Center Station is in Zone 2. Stations farther than nine miles from the core of Boston are in Zone 3. A double fare (\$1.70) is collected upon entering stations in Zones 2 and 3, and an additional fare of \$0.85 is charged upon exiting stations in Zone 3.

Green Line: The Green Line has four fare zones (see Figure 2-1). The subway section (Lechmere-Kenmore/Symphony) is in Zone 1 and has a base fare of \$0.85. The surface Green Line is divided into three fare zones: A, B and C. Zone A contains the B, C, and E Lines. The B Line extends 6.1 miles from the central zone and once on the surface, includes stops from Blandford Street to Boston College in Brighton. The C Line extends 4.8 miles from Park Street and makes all stops between St. Mary's Street and Cleveland Circle. The E Line extends 3.7 miles from the central zone and includes all surface stops from Northeastern through Heath Street in Roxbury. Zone B contains the portion of the D Line which extends 5.3 miles from the central zone and includes all surface stops from Fenway to Reservoir in Brookline. The D Line continues into Zone C which extends 11.6 miles from the central zone, from Chestnut Hill to Riverside. Base fares are \$0.85 in Zone A, \$1.00 in Zone B, and \$2.00 in Zone C. Fares for local trips in Newton (boarding west of Chestnut Hill and alighting no further east than Chestnut Hill) are \$1.00. Fares on all surface Green Line service are charged only in the inbound direction; outbound travel is free.

**Table 3-1**  
**Rapid Transit and Bus Adult Cash Fares**

	<b>One-Way Trip</b>	<b>Round-Trip Based<sup>14</sup></b>
<b><u>RAPID TRANSIT</u></b>		
<b>All Stations on Blue, Green, Orange and Red Lines, excluding Quincy Center, Quincy Adams, Braintree, surface Green Line stops &amp; Mattapan High Speed Trolley</b>	\$0.85	\$0.85
<b>Quincy Center (Zone 2)</b>	\$1.70	\$1.275
<b>Quincy Adams &amp; Braintree (Zone 3)</b>		\$1.70
Entrance fare	\$1.70	
Exit fare	\$0.85	
<b>Quincy Center, Quincy Adams &amp; Braintree Local (Zone 2/3)</b>	\$0.85 <sup>15</sup>	\$0.85 <sup>15</sup>
<b>Mattapan High Speed Trolley (Zone D)</b>		\$0.30 <sup>16</sup>
Inbound	\$0.60 <sup>16</sup>	
Outbound	free	
<b><u>Surface Green Line</u></b>		
<u>B, C, &amp; E Lines (Zone A)</u>		
Inbound	\$0.85	
Outbound	free	
Surface trips		\$0.425
Surface to subway trips		\$0.85
<u>D Line</u>		
Inbound Fenway Park - Reservoir (Zone B)	\$1.00	\$0.925
Inbound Chestnut Hill - Riverside (Zone C)	\$2.00	\$1.425
Inbound Newton Local (within Zone C)	\$1.00 <sup>17</sup>	\$0.50
Outbound (Zone B and C)	free	
<b><u>BUS</u></b>		
<b>Local/Zoned: One or two zones</b>	\$0.60	\$0.60
Three zones	\$1.00	\$1.00
<b>Express:</b>		
Zone 1	\$1.50	\$1.50
Zone 2	\$2.00	\$2.00
Zone 3	\$2.25	\$2.25
Zone 4	\$2.50	\$2.50

<sup>14</sup>Equivalent one-way cash fare (round-trip cost divided by two).

<sup>15</sup>With warrant. Full fare of \$1.70 is charged at boarding station and \$0.85 rebate is given at exit station.

<sup>16</sup>Pay fare upon exiting, except for Ashmont, which is free.

<sup>17</sup>With coupon. Coupon is given when exiting inbound trips in Newton and is good for next trip.

Bus and Trackless Trolley: Bus services are priced using a zone system. Bus zones are specific to each route and based upon distance. Local routes up to ten miles (which includes all but 29 routes) are considered to be single zoned routes; fares on these routes are \$0.60. Longer routes have multiple zones. The first two zones passed through cost \$0.60, while the third zone entered costs an additional \$0.40. Fares for express bus service, which operates along I-93, the Mass Pike, and to the North Shore, are between \$1.50 and \$2.25, depending on the number of zones passed through.

Commuter Rail: Commuter rail cash fares for trips to and from downtown Boston are between \$0.85 and \$4.75. The first zone traveled costs \$1.50 and each additional zone traveled through \$0.25 more (see Table 3-3). Interzone fares are not shown in the table.

### Special Fares

Reduced fares are available for senior citizens (age 65 and older), persons with disabilities, secondary school students, and children. Discount fares for these groups are generally 50 percent of the cash fare, rounded to the closest nickel. For senior citizens and persons with disabilities, fares are \$0.20 for rapid transit and surface Green Line service, and \$0.15 for local bus service. For all zoned and express bus trips and commuter rail, the discount is 50 percent. The discount provided other special groups (children age 5-12, and students) is 50 percent for all trips, as well. There are also student passes which are purchased by various school departments. These passes permit unlimited use of the local bus and rapid transit system by students on weekdays until 6:00 PM and cost the school district \$11.00 per student and month. Blind people and children under five ride free at all times on all services.

### PASS FARES

Adult monthly passes can be used for unlimited travel within the month of purchase for those services on which they are valid. In addition, the face value of passes can be used as partial payment on higher priced transit services, with the rider paying the difference in cash. The exceptions are subway passes which are not valid on buses, and vice versa.<sup>18</sup> Pass price break-even points (which is the number of monthly cash trips required to equal the cost of a monthly pass) are between 16 and 18 round trips, although there are a number of exceptions (see Table 3-2).

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<sup>18</sup>Subway passes may be used at certain locations on bus routes 1, 39, 49, and on all of the crosstown CT routes.

**Table 3-2**  
**Rapid Transit and Bus Pass Fares**

	Pass Type	Cost per Month	Break- Even Point <sup>19</sup>
<b><u>RAPID TRANSIT</u></b>			
<b>All Stations on Blue, Green, Orange and Red Lines, excluding Quincy Center, Quincy Adams, Braintree, surface Green Line stops &amp; Mattapan High Speed Trolley</b>	Subway	\$27	16
	Combo	\$46	18
	Combo Plus	\$48	14
<b>Quincy Center</b>			
<b>Quincy Adams &amp; Braintree</b>			
<b>Mattapan High Speed Trolley</b>	Bus	\$20	33
<b><u>Surface Green Line</u></b>			
<b><u>B, C, &amp; E Lines</u></b>			
Surface trips	Bus	\$20	24
Surface to subway trips	Subway	\$27	16
<b><u>D Line</u></b>			
Fenway Park-Reservoir			
Surface trips	Bus	\$20	20
Surface to subway trips	Subway	\$27	15
Chestnut Hill-Riverside			
Surface trips	Bus + \$1.00		18
Surface to subway trips	Combo	\$46	16
<b><u>BUS</u></b>			
<b>Local/Zoned: One or two zones</b>	Bus	\$20	17
	Bus + \$0.40		18
	Bus + \$1.40		19
	Bus + \$1.65		19
<b>Express:</b>	Zone 1		
	Zone 2		
	Zone 3		
	Zone 4		
	Combo	\$46	15
	Zone 1	\$64	16
	Zone 2	\$72	16
	Zone 3	\$82	16
<b><u>COMBINED RAPID TRANSIT &amp; BUS TRIPS</u></b>			
Local Bus to Zone 1 Rapid Transit or surface Green Line, except D Line beyond Reservoir	Combo	\$46	16-22
Local Bus to Zone 2 Rapid Transit or all surface Green Line	Combo	\$46	8-12
Local Bus to Zone 3 Rapid Transit	Combo Plus	\$48	8-10

<sup>19</sup>Number of round-trips.

Bus Pass: A local bus pass is valid for all local bus service, the Mattapan High Speed Line, and the surface Green Line service except Chestnut Hill to Riverside on the D Line. It can also be used as partial payment for service on zoned buses, and the Chestnut Hill to Riverside section of the D Line, with the difference being made up in cash or coupon. The price of this pass is \$20, and the break-even point for local bus riders is 17 round trips.

Subway Pass: The subway pass is valid for all Zone 1 rapid transit and Green Line service, and commuter rail service between downtown Boston and Zone 1A and 1B commuter rail stations. It is also valid on bus routes 1, 39, 49 at certain points, and on all of the crosstown CT routes. The price of this pass is \$27, having the break-even point at 17 trips.

Combo Pass: The combo pass is valid for all rapid transit service, except Quincy Adams and Braintree, all surface Green Line service, and all local bus service. Bus riders can also use the pass to pay for the first \$1.50 of express and zoned bus service. The price of this pass is \$46. Since two or more modes may be used in a single commute, the break-even point ranges from 8 to 22 round trips.

Combo Plus Pass: The combo plus pass is valid for all Combo pass service, plus Quincy Adams and Braintree stations. It is also valid for the first \$1.70 of express and premium bus route fares. The price of this pass is \$48. For Quincy Adams and Braintree pass users the break-even point is 14 round trips. When used in a multi-modal commute, the break-even point ranges from 8 to 10 round-trips.

Commuter Rail Passes: Zone 1 commuter rail pass prices are \$64. Commuter rail passes beyond Zone 1 (Zones 2 through 9) cost between \$72 and \$136. Break-even points for commuter rail trips are in the range of 8 to 17 round trips. Commuter rail 12-ride tickets are priced at the cost of 10 one-way trips (see Table 3-3).

10-Ride Tickets: 10-ride tickets are available in three different denominations for the Green Line and express bus routes: a 10-ride ticket which costs \$13.50 for ten \$1.50 rides, a 10-ride ticket which costs \$17.00 for ten \$2.00 rides, and a 10-ride ticket which costs \$20.00 for ten \$2.25 rides. The \$13.50 tickets are valid on "combo-level" express bus routes, such as to Medford, the North Shore as far as Saugus, and all the routes going through Netwon Corner. The \$17.00 tickets are valid "Zone 1" express bus routes to Lynn and the Green Line inbound from Riverside, while the \$20.00 tickets are valid on "Zone 2" express bus routes to Riverside, Waltham, Burlington, and the North Shore towns Salem, Swampscott, Marblehead, and Nahant.



**Table 3-3**  
**Commuter Rail Fares**

To/from Boston	One-way Trip	Cost of Pass per Month	Break-even Point <sup>20</sup>
Zone 1A	\$0.85	\$27.00	8-16
Zone 1B	\$1.25	\$27.00	7-11
Zone 1	\$2.00	\$64.00	12-16
Zone 2	\$2.25	\$72.00	12-16
Zone 3	\$2.50	\$82.00	13-17
Zone 4	\$3.00	\$94.00	13-16
Zone 5	\$3.25	\$104.00	13-16
Zone 6	\$3.50	\$112.00	13-16
Zone 7	\$3.75	\$120.00	14-16
Zone 8	\$4.00	\$128.00	14-16
Zone 9	\$4.75	\$136.00	13-15

<sup>20</sup>Number of round-trips: the lower bound assumes a transfer to rapid transit, the upper bound assumes no transfers.

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## 4. Methods of Statistical Analysis

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Because of the expense and time that is required to count all of the MBTA's riders, system-wide ridership estimates are based upon the total revenue collected by the MBTA and the fare payment characteristics of a sampled portion of MBTA ridership. For each mode, this requires reliable estimates of the average passenger fare, as well as an estimate of the proportion of passengers using each fare category (the "fare-mix"). The estimates of average fares are used in conjunction with revenue figures to determine total ridership by mode. The fare category proportions are then used in conjunction with the total ridership figures to determine the total number of passengers paying each type of fare on each mode.

Fare-mix figures were obtained through a survey which recorded the proportion of passengers by fare category; average fares were obtained by recording the amount of revenue paid divided by the number of passengers. Both types of observations were made for a random sample of heavy rail, light rail, and bus riders. Sampling programs of this type were first instituted by CTPS and the MBTA in 1981; since that time, variations of the sampling program have been used to develop fare-mix information.

Average fares and fare category proportions were obtained for each mode: heavy rail, light rail (with subway and surface Green Line analyzed separately<sup>21</sup>), bus/trackless trolley, and commuter rail. Surface Green Line, bus, and trackless trolley data were obtained by recording the type of fare paid by boarding passengers on the sampled trips, as well as farebox revenue data. Rapid transit data were obtained by recording the fare paid by passengers entering selected subway stations through turnstiles and collector's turnstiles; station farebox data was also recorded. Commuter rail data were not obtained for the 1996 *Fare-Mix Study*; they are taken from a 1993 passenger survey. Subsequently, modal ridership estimates were obtained by dividing modal revenue by the respective modal average fare. Systemwide information is obtained by combining the separate modal estimates.

The 1996 *Fare-Mix Study* used principally the same method to calculate average fares and ridership as was used in the 1992 study. However,

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<sup>21</sup>The reason for a separate surface Green Line analysis in the 1996 *Fare-Mix Study* is to be able to compare the data with the figures of the 1992 *Fare-Mix Study*.

"Average Cash & Token Fares" were not calculated, because they do not provide important information. Instead the "true average fare", which includes pass revenue, and the "average pass ride value" were estimated for each mode of the transit system: heavy rail (rapid transit and subway Green Line separately), light rail (surface Green Line separately), bus/trackless trolley, and commuter rail. The method used for the 1996 study is as follows:

Average farebox deposit for each system is calculated by dividing sampled farebox revenue by sampled passengers:

$$(1) \text{ Average Farebox Deposit} = \frac{\text{Farebox Revenue}}{\text{Number of Passengers}}$$

Total passenger trips can then be estimated by taking the ratio of total cash and token revenue to the average farebox deposit:

$$(2) \text{ Total Passenger Trips} = \frac{\text{Total Cash \& Token Revenue}}{\text{Average Farebox Deposit}}$$

Before the true average fare can be computed, it is necessary to

- Determine the usage rate of each system by each pass type, which is the ratio of received value on one system to the received value on all systems for which the pass is valid<sup>22</sup>:

$$(3) \text{ Usage Rate of System } Y_k \text{ by Pass Type } X_i = \frac{\text{Number of Trips per Month on } Y_k \cdot \text{One-way Fare for } Y_k}{\sum \text{Number of Trips on } Y_k \cdot \text{One-way Fare for } Y_k}$$

In the case that the pass can be used only on one system, the usage rate equals one.

- Distribute the proportion of pass revenue for each pass type to each system, according to the usage rate of the system by pass type:

$$(4) \text{ Pass Revenue of Pass Type } X_i \text{ for System } Y_k = \text{Pass Revenue for } X_i \cdot \text{Usage Rate of } Y_k \text{ by } X_i$$

- Get the total pass revenue for each system, which is the sum of the pass revenues for all different pass types used at each system:

$$(5) \text{ Total Pass Revenue for System } Y_k = \sum \text{Pass Revenue of Pass Type } X_i \text{ for } Y_k$$

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<sup>22</sup>The usage rate for each system by pass type was estimated with data from the MBTA Systemwide Passenger Survey.

- Find the total revenue for each system by adding up total pass revenue and total cash and token revenue:

$$(6) \text{ Total Revenue for System } Y_k = \text{Total Pass Revenue for } Y_k + \text{Total Cash \& Token Revenue for } Y_k$$

Finally, the true average fare and the average pass ride value for each system are calculated by dividing total revenue by total passenger trips:

$$(7) \text{ True Average Fare for System } Y_k = \frac{\text{Total Revenue for } Y_k}{\text{Total Passenger Trips on } Y_k}$$

$$(8) \text{ Average Pass Ride Value for System } Y_k = \frac{\text{True Avg. Fare} - \text{Avg. Farebox Deposit}}{\text{Percent of Passengers Using Pass}}$$

An example of the above described method is given in Box 4-1, based on simplified fare-mix figures.

**Box 4-1**  
**Example of a Fare-Mix Calculation with Simplified Figures**

Fare-Mix Data

BUS:	Cash Riders:	165	(50%)
	Pass Riders:	<u>165</u>	(50%)
	Passengers:	330	
	Farebox Revenues:	\$99	
RAIL:	Cash Riders:	300	(66%)
	Pass Riders:	<u>150</u>	(33%)
	Passengers:	450	
	Farebox Revenues:	\$180	

Additional Data

One-way Fare for Bus:	\$0.60	
One-way Fare for Rail:	\$0.85	
Total Farebox Revenues for Bus:	\$1,020,000	
Total Farebox Revenues for Rail:	\$4,250,000	
Pass Revenue for Bus Pass:	\$400,000	(\$20 per pass)
Pass Revenue for Rail Pass:	\$1,620,000	(\$27 per pass)
Pass Revenue for Combo Pass:	\$1,380,000	(\$46 per pass)
Combo Pass Bus Trips per Month:	30	
Combo Pass Rail Trips per Month:	45	

First the average farebox deposit is calculated:

$$(1) \text{ Average Farebox Deposit} = \text{Farebox Revenue} / \text{Passenger}$$

$$\text{for BUS:} = \$99 / 330 \text{ riders} = \$0.30$$

$$\text{for RAIL:} = \$180 / 450 \text{ riders} = \$0.40$$

This figure is then used to determine total passenger trips:

$$(2) \text{ Total Passenger Trips} = \text{Cash \& Token Revenue} / \text{Average Farebox Deposit}$$

$$\text{for BUS:} = \$1,020,000 / \$0.30 = 3,400,000 \text{ riders}$$

$$\text{for RAIL:} = \$4,250,000 / \$0.40 = 10,625,000 \text{ riders}$$

The usage rate of each system by pass type is:

$$(3) \text{ Usage Rate of System } Y_k \text{ by Pass Type } X_i$$

$$= \frac{\text{Number of Trips per Month on } Y_k \cdot \text{One-way Fare for } Y_k}{\sum \text{Number of Trips on } Y_k \cdot \text{One-way Fare for } Y_k}$$

$$\text{for Bus Pass on BUS:} = 1$$

$$\text{for Rail Pass on RAIL:} = 1$$

$$\text{for Combo Pass on BUS:} = \frac{30 \cdot \$0.60}{(30 \cdot \$0.60) + (45 \cdot \$0.85)} = \frac{18}{18 + 38.25} = 0.32$$

$$\text{for Combo Pass on RAIL:} = \frac{45 \cdot \$0.85}{(30 \cdot \$0.60) + (45 \cdot \$0.85)} = \frac{38.25}{18 + 38.25} = 0.68$$

The pass revenue for each system by pass type is:

$$(4) \text{ Pass Revenue of Pass Type } X_i \text{ for System } Y_k$$

$$= \text{Pass Revenue for } X_i \cdot \text{Usage Rate of } Y_k \text{ by } X_i$$

$$\text{for Bus Pass on BUS:} = \$400,000 \cdot 1 = \$400,000$$

$$\text{for Combo Pass on BUS:} = \$1,380,000 \cdot 0.32 = \$441,600$$

$$\text{for Rail Pass on RAIL:} = \$1,620,000 \cdot 1 = \$1,620,000$$

$$\text{for Combo Pass on RAIL:} = \$1,380,000 \cdot 0.68 = \$938,400$$

Total pass revenue for each system is:

$$(5) \text{ Total Pass Revenue for System } Y_k$$

$$= \sum \text{Pass Revenue of Pass Type } X_i \text{ for } Y_k$$

$$\text{for BUS:} = \$400,000 + \$441,600 = \$841,600$$

$$\text{for RAIL:} = \$1,620,000 + \$938,400 = \$2,558,400$$

Total revenue for each system is:

(6) Total Revenue for System  $Y_k$

= Total Pass Revenue for  $Y_k$  + Total Cash & Token Revenue

for BUS: = \$841,600 + \$1,020,000 = \$1,861,600  
for RAIL: = \$2,558,400 + \$4,250,000 = \$6,808,400

Then the true average fare for the system can be estimated:

(7) True Average Fare for System  $Y_k$

= Total Revenue for  $Y_k$  / Total Passenger Trips on  $Y_k$

for BUS = \$1,561,600 / 3,400,000 = \$0.459  
for RAIL = \$6,808,400 / 10,625,000 = \$0.641

(8) Avg. Pass Ride Value

= (True Avg. Fare - Avg. Farebox Deposit) / Percent of Pass Use

for BUS = (\$0.459 - \$0.30) / 0.5 = \$0.159 / 0.5 = \$0.318  
for RAIL = (\$0.641 - \$0.40) / 0.333 = \$0.241 / 0.333 = \$0.723

"Rapid Transit" or "RT" includes passenger trips starting at both heavy rail (Red, Orange and Blue Lines), and the subway Green Line; "Red, Orange & Blue Lines" or "ROB" accounts for all heavy rail station boardings, excluding transfer stations to the Green Line; and "Subway Green Line" or "Subw. GL" includes trips starting at subway Green Line stations, including transfer stations to heavy rail lines. Rapid transit values, weighted by the number of passenger trips on the heavy rail system and the subway Green Line, are used for calculating "RT weighted 1996" figures, also called "Weighted 96". In future fare-mix studies, this category will replace the "Spring 1996" category for rapid transit, which follows the old unweighted approach.

"Heavy Rail System 1996", or "HR System 96", represents the entire heavy rail system, including those passengers who boarded heavy rail lines (Red, Orange and Blue Lines) at Green Line transfer stations. Similarly, "Light Rail System 1996", or "LR System 96", represents the results for the entire light rail system (surface Green Line and subway Green Line), including the passengers who started their Green Line trip at transfer stations.

The average fare figures for each system are calculated by summing up the average fares of all portions of that system, weighted by the number of passengers using each portion:

#### 4. METHODS OF STATISTICAL ANALYSIS

##### Average Farebox Deposit for the Heavy Rail System

$$= \frac{((\text{Average Farebox Deposit at HR} \cdot \text{Passenger Trips starting at HR}) + (\text{Avg. Farebox Deposit at SwGL} \cdot \text{Heavy Rail Trips starting at SwGL}))}{(\text{Passenger Trips starting at RT} + \text{Heavy Rail Trips starting at SwGL})}$$

with: HR the Heavy Rail Stations excluding Green Line Transfer Stations  
SwGL all Subway Green Line Stations incl. Transfer Stations to HR

##### Average Farebox Deposit for the Light Rail System

$$= \frac{((\text{Average Farebox Deposit on SfGL} \cdot \text{Passenger Trips on SfGL}) + (\text{Avg. Farebox Deposit at SwGL} \cdot \text{Trips on Green Line starting at SwGL}))}{(\text{Passenger Trips on SfGL} + \text{Trips on Green Line starting at SwGL})}$$

with: SfGL the Surface Green Line

In the tables of the next chapter "April 1992" refers to the results of the 1992 *Fare-Mix Study* and "Furth Analysis 1992" to the revised results of the 1992 data generated by Peter G. Furth<sup>23</sup>. "Spring 1996" is the category for the unweighted figures of the data collection effort undertaken in April, May and June 1996. In most cases "Spring 1996" values are comparable to the values of "April 1992", since they were derived by similar methods. For the weekday surface Green Line "Spring 1996" figure, the "Furth Analysis 1992" provides a better basis for comparison. For rapid transit, the "Furth Analysis 1992" results can be best compared to the weighted 1996 figures.

Precision figures are computed only for the overall average fares and shown in parentheses. They are based on the 95% confidence level. For discussion of "Possible Sources of Bias" and "Future Improvements for Sampling and Surveying," refer to Appendix C.

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<sup>23</sup>Published in the MBTA *Supplemental Draft Environmental Impact Report on the 1991 Fare Increase*.

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## 5. Sampling Program, Data Collection and Results of Analysis

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As previously mentioned, to calculate ridership from revenue information, a reliable estimate of average farebox deposit is required. Estimates of these parameters were obtained by recording the proportion of passengers by fare type and fare revenue for a sample of heavy rail, light rail, and bus riders.

Separate sampling programs were designed for each mode to obtain modal estimates of average farebox deposit, riders by fare category, total ridership, and true average fare. The modal estimates were then combined to obtain system-wide estimates.

Traffic checkers at CTPS and the MBTA performed the actual surveys. CTPS was responsible for providing sample lists, survey forms, instructions, and training, as well as processing and analyzing the data. All forms used in the data collection are shown in Appendix A.

### HEAVY RAIL

The heavy rail system consists of the Red, Blue and Orange lines. Heavy rail together with the subway Green Line is called "Rapid Transit" or "RT", and "Red, Orange & Blue lines" or "ROB" refers to heavy rail without subway Green Line stations. The subway Green Line are sampled together with the Red, Orange and Blue lines, since the fare and station entering characteristics of both systems are very similar, however, they are analyzed separately.

Subway passengers enter the system at station entrances through one of three fare collection devices: turnstiles, collector's turnstiles, or gates. Most passengers enter through turnstiles (or "Perry" boxes). Those paying reduced fares enter through the collector's turnstile (which is the one next to the station agent) and deposit their fare in the collector's box (or "S-box").

At the busiest stations, during peak flow periods, passengers can also enter through a manned gate and show passes or deposit cash fares or tokens in the "gateman's" box. For pre-1992 fare-mix studies, the "gateman's" box was open more often, but in 1996 (as in 1992), most were closed to reduce fare evasion.



## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

All turnstiles contain counters that register the number of times the turnstile turns, and thus the number of passengers that pass through. Turnstiles equipped with pass readers also have a second register that records pass use. (For the list of sampled locations and times, see Appendix A.)

### Sample Design

Turnstiles and Collector's Turnstiles: There are 60 rapid transit stations. Passengers can enter at more than one entrance at several stations, resulting in a total of 73 collector's booth and turnstile locations. A theoretically sound statistical sample design could not be developed for the rapid transit fare-mix program because data on the data variability by station was not available. Instead, the sample design was driven by the availability of survey personnel, and the need to utilize an appropriate level of resources.

Over 292 person-days (eight hours) would have been required to provide a two-person survey crew for one day (16 hours) at each of the 73 revenue locations. With the six surveyors actually available per day, surveying in this manner would have taken 40 days. If separate weekend fare-mix information at the same precision were also collected, the amount of survey time would have been higher. Since this amount of time was not available, an alternative sample procedure was devised.

Each station was sampled between one and two hours, with twelve different time periods: Early Morning (6:00 to 7:00 AM), AM Peak (7:00 to 8:30 AM), Morning (8:30 to 10:00 AM), Late Morning (10:00 to 11:30 AM), Lunch Time (11:30 AM to 1:00 PM), Afternoon (1:00 to 2:30 PM), School Peak (2:30 to 4:00 PM), PM Peak (4:00 to 6:00), Evening (6:00 to 7:30 PM), Mid-evening (7:30 to 9:00 PM), Late Evening (9:00 to 10:30 PM), and Night (10:30 to 12:00 PM). Stations were selected for each time period randomly. However, downtown and suburban stations, as well as peak and off-peak periods were sampled at a different rate, depending on the ridership volume. The sampling rate for high ridership volume stations was 45%, and for low ridership volume stations 3%.<sup>24</sup> The total sample size was 108, including 85 weekday locations and 33 weekend locations. 26 of the sample locations were at Green Line stations.

Gatebox: Gateman's boxes are only open on special occasions, at limited locations (i.e. State Street during the PM Peak, or Kenmore before and after Red-Sox games). On account of this, no gates were surveyed in 1996.

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<sup>24</sup>That is, each high volume station-period had a 45% chance of being sampled, while the low volume station-periods had a 3% chance of being sampled. Overall, there were 166 high volume station-periods and 710 low volume station periods.

### Survey Procedure

Two-person teams were used at each location: one person for surveying the fare-mix through the collector's turnstile, and the other person for surveying the fare-mix through the regular turnstiles. Because of the reliability problems with the turnstile registers, each turnstile was tested prior to each survey shift to determine which turnstile's registers were working and which were not. Turnstiles with non-working registers could not just be ignored, depending on whether the non-working turnstile had a passreader or not, the proportion of pass users through a non-working turnstile would differ from the overall proportion at the survey location. Ignoring the non-working turnstile(s) would skew the total estimate for that location. It was recommended that survey teams arrive at the survey location  $1/2$  hour before the survey was scheduled to begin in order to have time to perform the test.

Turnstile registers were tested using one of two methods: a *quick* test or an *actual passenger* count test. A turnstile test form, shown in Appendix A, was used to record the results of each test for each turnstile. The form listed the ID numbers for each turnstile in the location to be surveyed. If the ID number is EP-xxx then the turnstile has a pass reader; if the ID is P-xxx it does not. The form has space for testing six turnstiles; locations with more than six turnstiles required the use of two (or more) forms.

To perform a *quick test*, the surveyor used his/her own pass to run the pass through the pass reader (if the turnstile had one) and check the small register near the passreader to see if it was recording properly. Then using tokens, the surveyor checked the larger turnstile register. The surveyor then noted on the form the kind of test performed, and whether the registers were working.

To perform an *actual passenger count test*, the surveyor recorded both the passreader and turnstile register readings in the turnstile and pass boxes on the register reading side of the form. The surveyor also recorded the two beginning manual counter register readings (which, if the counter was zeroed out first, should both have been zero) in the pass and token boxes on the manual count side of the form. The surveyor then counted the number of pass-users and token-users going through the turnstile for a few minutes (but at least 10 passengers). The ending turnstile and counter readings were then recorded. On the register side, the number of token users was derived by subtracting pass-users (if passreader) from the turnstile count. On the count side, total turnstile users was derived by adding pass and token users. Totals were generated by subtracting the beginning counts from the ending counts for each column. The surveyor then noted on the test form the kind of test performed and whether the register(s) worked.

A combination test also could be performed: a surveyor tested the passreader with his/her own pass, and counted total passengers (to test the turnstile

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

register). If this test was performed, the surveyor checked both boxes—quick and pax<sup>25</sup>—under type of test performed. After the turnstile tests were performed, the surveyors could close turnstiles that had non-functioning registers.

Regular Turnstile Survey: On the turnstile count form, shown in Appendix A, the surveyor noted the kind of survey that was performed for each turnstile: automatic (using the registers) or manual (using the hand counter), or whether the turnstile was closed. The number of turnstiles that could have been manually surveyed at the same time varied with the amount of passenger traffic. It was not possible to manually survey more than one at very busy locations. In the 1996 fare-mix survey, no manual counts were taken; all turnstiles with non-functioning registers were closed.

At the beginning of the survey, the surveyor recorded beginning turnstile and passreader register readings in the turnstile and pass boxes for each "automatic" turnstile. The surveyor recorded the actual survey start time for each turnstile and began the survey. He/she also recorded intermediate turnstile register readings at the end of the first, second, and third half-hours. At the end of the survey, the surveyor recorded the ending register readings and the actual stop time.

Collector's Turnstile Survey: At the beginning of the collector's turnstile survey, eleven types of data were recorded on the Collector's Turnstile form: the beginning farebox readings, the beginning turnstile meter readings, the beginning controller reading, and the seven (one for each fare category) beginning manual counter readings (which should have been zero after resetting the counter bank), and the actual survey start times. The surveyor was supposed to make sure the collector ran down the farebox before recording the register readings. To perform the survey, the surveyor used a manual counter to record each passenger's method of fare payment.

At the end of every half and/or full hour, the surveyor recorded intermediate farebox, turnstile meter, controller, and manual count register readings. At the end of the survey, all ending register readings and the actual time the readings were taken were recorded. The ending readings should all have been taken at the same time.

### Survey Coding, Processing and Sample Results

The completed forms were checked for accuracy and completeness by CTPS, and, where possible, corrections were made. The data on the forms were then

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<sup>25</sup>"Pax" is an abbreviation for passenger.

keyed into two different data files, one each for turnstiles and collector's boxes. The records are documented in Appendix B.

**Turnstiles:** The survey in spring 1996 resulted in 70 acceptable weekday records and 31 acceptable weekend records. 22 of the total 101 records are from subway Green Line stations. Only two methods of fare payment—tokens (adult cash) or adult passes—can be used at turnstiles. Sample estimates of fare category proportions for passengers that entered through turnstiles were generated by summing passengers across station records, and dividing by the total number of passengers. These sample estimates are shown in Table 5-1. Compared to 1992, pass use decreased in 1996 during the week and increased during the weekend. During the week more passengers use a pass on the Red, Orange and Blue lines than on the subway Green Line, whereas during the weekend the opposite is true.

**Table 5-1**  
**Rapid Transit, Subway Green Line and Heavy Rail**  
**Turnstile Fare Category Proportions in Percentages**

		<u>Adult Cash</u>	<u>Adult Pass</u>
<b><u>Weekday:</u></b>	RT April 1992	54.5	45.5
	RT Spring 1996	56.5	43.5
	RT weighted 1996	56.4	43.6
	Red, Orange & Blue Lines	52.7	47.3
	Subway Green Line	67.4	32.6
	Heavy Rail System 1996	53.7	46.3
<b><u>Weekend:</u></b>	RT April 1992	63.8	36.2
	RT Spring 1996	59.3	40.7
	RT weighted 1996	59.6	40.4
	Red, Orange & Blue Lines	60.2	39.8
	Subway Green Line	57.6	42.4
	Heavy Rail System 1996	60.0	40.0

Table 5-2 shows the calculated average farebox deposits for the turnstile sample. From 1992 to 1996, the average farebox deposit increased weekdays and decreased weekends. The weekday average farebox deposit on the Red, Orange and Blue lines is lower than that on the subway Green Line, but on the weekend the opposite is true. However, Quincy Center, Quincy Adams and Braintree were not surveyed on weekends, which makes the average farebox deposit figures for the Red Line slightly lower than they are in reality.

Table 5-2  
Rapid Transit, Subway Green Line and Heavy Rail  
Turnstile Average Farebox Deposit in Dollars

	Avg. Farebox <u>Deposit</u>
<u>Weekday:</u> RT April 1992	0.490
RT Spring 1996	0.512
RT weighted 1996	0.511
Red, Orange & Blue Lines	0.490
Subway Green Line	0.573
Heavy Rail System 1996	0.496
 <u>Weekend:</u> RT April 1992	 0.575
RT Spring 1996	0.504
RT weighted 1996	0.506
Red, Orange & Blue Lines	0.512
Subway Green Line	0.490
Heavy Rail System 1996	0.510

Collector's Turnstiles: Collector's turnstile surveys were performed at the same times and locations as the regular turnstile surveys. Only non-adult cash or non-adult pass rapid transit passengers are supposed to pay their fare at collector's turnstiles. However, adult fare passengers sometimes also use the collector's turnstiles. Therefore, collector's turnstile passengers are categorized into seven groups based on the methods of fare payment: Adult cash fare (\$0.85 or \$1.70), adult monthly pass, reduced fare for senior citizens and persons with disabilities (\$0.20), children fare (50% of adult fare: \$0.40 to \$0.85), student pass (free during school periods until 6:00 PM), authorized free (MBTA employees, as well as passengers with free transfers from certain bus routes, and on Sundays a free second passenger on a monthly pass), and unauthorized free (fare evaders).

Farebox register readings were used to record the *actual* farebox revenue for passengers passing through collector's turnstiles. These farebox readings may differ from the actual revenue because of malfunction of the registers, the operator not running down the farebox prior to recording the readings, or inaccurate recording of the register readings.

To provide a check for reasonableness of the farebox revenue for each location, the collector's turnstile record spreadsheet generated an independent

estimate of the minimum farebox revenue that should have been deposited at the location based on surveyed fare category proportions. This estimate was used to approximate collector's turnstile farebox revenue for locations where the farebox register data were suspect.

Table 5-3 shows collector's turnstile sample estimates of fare category proportions. In 1996, fewer passengers who are not supposed to enter at the collector's turnstile (such as adult cash payers and pass holders), actually did use the collector's turnstile. Because there were fewer adult cash riders and pass users at the collector's turnstile, the percentages of senior citizens and disabled people, as well as those of children and students were higher. Two

**Table 5-3**  
**Rapid Transit, Subway Green Line and Heavy Rail**  
**Collector's Turnstile Fare Category Proportions in Percentages**

		<u>Adult Cash</u>	<u>Adult Pass</u>	<u>Sen. Cit. &amp; Disabled</u>	<u>Child Half</u>	<u>Stud. Pass</u>	<u>Free</u>
<b><u>Weekday:</u></b>	RT April 1992	9.4	31.0	29.7	5.4	15.7	8.8
	RT Spring 1996	8.6	18.0	33.5	11.5	19.0	9.5
	Weighted 96	7.4	18.2	34.3	12.0	17.4	10.8
	ROB	9.8	17.8	32.6	11.1	20.6	8.2
	Subw. GL	0.3	19.4	39.4	14.6	7.7	18.6
	HR System 96	9.1	17.9	33.1	11.3	19.7	8.8
<b><u>Weekend:</u></b>	RT April 1992	10.7	28.6	30.7	10.9	0.8	18.3
	RT Spring 1996	7.7	24.8	37.0	15.2	0.3	15.0
	Weighted 96	7.7	24.5	36.4	15.4	0.3	15.7
	ROB	7.8	26.5	40.7	14.1	0.3	10.5
	Subw. GL	7.3	18.7	23.4	19.1	0.4	31.1
	HR System 96	7.8	26.0	39.6	14.5	0.3	11.9

results are suspicious, and may be due to data collection or sampling errors. First, on weekdays only 0.3% of the passengers passing the collector's turnstile at subway Green Line stations pay cash, which is very low compared to stations on the Red, Orange and Blue lines, where 9.8% of the passengers pay cash. And secondly, on weekends 31.1% of the subway Green Line boardings through the collector's turnstile were in the category free, a figure about three times higher than at stations on the Red, Orange and Blue lines.

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

Average farebox deposit for the collector's turnstile sample is shown in Table 5-4. The average farebox deposit was stable for weekends, but increased for weekdays, since the rate of adult pass holders fell more than the rate of passengers paying cash.

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**Table 5-4**  
**Sample Subway Green Line/Rapid Transit Collector's Turnstile**  
**Average Farebox Deposit in Dollars**

	<b>Avg. Farebox Deposit</b>
<b><u>Weekday:</u></b>	
RT April 1992	0.162
RT Spring 1996	0.191
RT weighted 1996	0.182
Red, Orange & Blue Lines	0.200
Subway Green Line	0.129
Heavy Rail System 1996	0.195
<b><u>Weekend:</u></b>	
RT April 1992	0.186
RT Spring 1996	0.186
RT weighted 1996	0.185
Red, Orange & Blue Lines	0.190
Subway Green Line	0.169
Heavy Rail System 1996	0.186

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### Fare Category Proportions and Average Fares

Separate estimates of entries into the rapid transit system through the turnstiles and collector's turnstile were calculated based upon the amount of revenue collected at each. Total ridership was then determined by combining the turnstile and collector's turnstile data. Only stations with both turnstile records were used for the 1996 calculation, which was not the case in the 1989 and 1992 *Fare-Mix Studies*, when the number of records from collector's turnstiles was greater than the number of regular turnstiles. As a result, the collector's turnstile had a higher weight in 1989 and 1992, leading to overstating all fare categories but adult cash and pass, especially senior citizen and disabled people. As a result the average farebox deposit was too low, which caused the number of passenger boardings to be overestimated.<sup>26</sup>

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<sup>26</sup>According to the 1992 *Fare-Mix Study* about 18.5% of all passengers entered the station through the collector's turnstile, whereas in 1996 only 10.2% did so, the latter number being

Table 5-5 shows the fare category by week, the weekdays and the weekend. Between 1992 and 1996 the percent of passengers paying cash increased on weekdays and decreased on weekends. The trend for passengers who hold a pass was the opposite. For the whole week, there were more cash payers and slightly fewer pass users. On weekdays and during the whole week, the subway Green Line had more cash payers and less pass users compared to the Red, Orange and Blue lines. The drop in the percentage of senior citizens and disabled persons between 1992 and 1996 can be explained by analysis error of the 1992 Fare-Mix Study mentioned above. Even though a sampling and/or data collection error is also possible in the 1996 estimation, the result of 3.5% of all riders being in this category, as opposed to 6.1% in 1992, is more consistent with the surface Green Line values (1992: 3.6%, and 1996: 4.0%).

**Table 5-5**  
**Rapid Transit, Subway Green Line and Heavy Rail**  
**Fare Category Proportions in Percentages**

		<u>Adult</u> <u>Cash</u>	<u>Adult</u> <u>Pass</u>	<u>Sen. Cit.</u> <u>&amp; Disabled</u>	<u>Child</u> <u>Half</u>	<u>Stud.</u> <u>Pass</u>	<u>Free</u>
<b><u>Week:</u></b>	RT April 1992	46.2	41.6	6.1	1.3	2.7	2.1
	RT Spring 1996	52.0	40.7	3.5	1.3	1.6	1.1
	Weighted 96	51.9	40.7	3.5	1.3	1.6	1.1
	ROB	48.5	43.2	4.0	1.4	2.0	1.0
	Subw. GL	62.1	33.5	2.0	0.9	0.3	1.3
	HR System 96	49.4	42.5	3.9	1.3	1.9	1.0
<b><u>Weekday:</u></b>	RT April 1992	45.0	42.4	6.3	1.1	3.3	1.8
	RT Spring 1996	51.9	41.0	3.2	1.1	1.8	0.9
	Weighted 96	52.0	41.0	3.2	1.1	1.8	0.9
	ROB	48.0	44.0	3.6	1.2	2.3	0.9
	Subw. GL	64.1	32.0	2.0	0.7	0.4	0.9
	HR System 96	49.1	43.2	3.5	1.2	2.2	0.9
<b><u>Weekend:</u></b>	RT April 1992	54.0	34.8	5.7	2.0	0.1	3.4
	RT Spring 1996	52.2	38.5	5.1	2.1	0.0	2.1
	Weighted 96	52.1	38.3	5.5	2.1	0.0	2.0
	ROB	51.8	37.6	6.6	2.3	0.1	1.7
	Subw. GL	53.1	40.3	2.1	1.7	0.0	2.8
	HR System 96	51.9	37.8	6.3	2.2	0.1	1.8

more realistic. This implies that all 1992 rapid transit fare categories but adult cash and pass are nearly two times too high.



## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

The overall results for the average farebox deposit and the true average fare are shown in Table 5-6. Between 1992 and 1996 the average weekday farebox deposit seems to increase, but whether this is true remains unclear, because of the likelihood that the 1992 figure was too low. The farebox deposit is higher for the subway Green Line than for the Red, Orange and Blue lines because more people on the Green Line pay cash. On the weekend the farebox-deposit decreased, which might be partially due to the lack of surveyed stations in rapid transit Zone 2 and 3 (Quincy Center, Quincy Adams and Braintree). There is also virtually no difference between the subway Green Line and the Red, Orange and Blue lines on weekends. The true average fare for the heavy rail system, which includes cash fares as well as pass revenue, is \$0.815.

Table 5-6  
Rapid Transit, Subway Green Line and Heavy Rail  
Average Fares in Dollars

		Avg. Farebox Deposit	True Avg. Fare	Avg. Pass Ride Value
<u>Week:</u>	RT April 1992	0.432		
	RT Furth Analysis 1992	0.444 (12.8%)		
	RT Spring 1996	0.478 (10.9%)		
	RT weighted 1996	0.477 (10.6%)		
	Red, Orange & Blue Lines	0.458 (13.8%)		
	Subway Green Line	0.533 (15.0%)		
	Heavy Rail System 1996	0.463 (12.4%)	0.815	0.828
<u>Weekday:</u>	RT April 1992	0.421		
	RT Furth Analysis 1992	0.437 (14.6%)		
	RT Spring 1996	0.481 (12.5%)		
	RT weighted 1996	0.481 (11.9%)		
	Red, Orange & Blue Lines	0.458 (15.9%)		
	Subway Green Line	0.551 (17.1%)		
	Heavy Rail System 1996	0.464 (14.1%)		
<u>Weekend:</u>	RT April 1992	0.503		
	RT Furth Analysis 1992	0.508 (18.8%)		
	RT Spring 1996	0.460 (12.0%)		
	RT weighted 1996	0.460 (12.0%)		
	Red, Orange & Blue Lines	0.460 (12.3%)		
	Subway Green Line	0.461 (31.0%)		
	Heavy Rail System 1996	0.460 (11.0%)		

(Note: Numbers in parentheses are the precision figures at the 95% confidence level.)

The average pass ride value of \$0.828 implies that the number of trips taken by pass users is not very much above the break-even point, causing it to be only 9.8% lower than an estimated average adult cash fare on heavy rail of approximately \$0.92.<sup>27</sup> Surveys of pass usage usually indicate that pass users ride the system significantly more frequently than the break-even level. The discrepancy between these two findings is explained by the different approaches to the average pass ride value figure. In this fare-mix survey, the value was derived by dividing total pass revenue attributable to one mode (say, heavy rail) by the apparent number of trips for which the pass was used. All type of passes are included in the calculation, even higher cost passes (combo, combo plus and commuter rail passes). In contrast, pass survey figures are derived by dividing the reported number of monthly trips for each pass type by the price of each of the pass types. Thus, while the average pass ride value for a subway pass may be \$0.46 (according to a 1994 survey), the average pass ride value for all types of passes would be closer to the \$0.828 found in this study. Also, it is likely that the respondents in passenger surveys are those riders who use the system most often, and they may even overstate their usage. To the extent that this is the case, the average pass ride value derived from passenger surveys would be too low.

### LIGHT RAIL

This fare-mix report is the first one that analyzes the surface Green Line together with the subway portion of the Green Line. However, in order to be able to compare the data with earlier fare-mix reports the results for the surface and subway portions of the Green Line are also presented separately.

For data collection purposes the surface Green Line is sampled differently from the subway portion. The overall average farebox deposit is calculated by weighting the averages from the surface Green Line and the Green Line portion of the subway.

The light rail system consists of four Green Line branches (B, C, D, and E), as well as the Mattapan High Speed Line, which was not surveyed because virtually no fares are collected. The sections of the B, C, and D Line west of Kenmore and the E Line west of Copley and north of North Station are considered surface Green Line. The turnstiles at Lechmere are used only during the morning peak period. At other times, fares at Lechmere are collected on board.

Green Line riders are classified as either "Subway Green Line" or "Surface Green Line" passengers depending on where they enter the MBTA system.

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<sup>27</sup>This figure and the average pass ride value both include trips taken from Zone 2 and 3 stations.

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

Persons boarding the Green Line on the surface are considered surface Green Line passengers irrespective of where they are traveling to. Conversely, outbound riders boarding the Green Line in the subway portion are considered subway Green Line passengers. (As a result of these definitions, there are more inbound than outbound riders on the surface Green Line.)

### Sample Design

An adaptation of the Section 15 revenue-based sampling procedure (normally used for buses) was applied to the surface Green Line fare-mix survey with the following differences:

- Surface Green Line fares are collected only in the inbound direction; no fare is charged on the surface in the outbound direction. In the inbound direction, surveyors conducted a survey in a manner similar to that conducted for buses: farebox register readings were recorded at the beginning and the end of the trip, and boarders were classified according to their fare payment method. In the outbound direction, register readings were not recorded (since no fares are collected), and all boarders were classified in the authorized free fare category.
- The sample was stratified by line and the following time periods: Weekday early, AM, Base, School, PM, and Evening, as well as Weekends. This procedure follows the "Technical Memorandum" for statistical analysis of MBTA ridership data from Peter G. Furth<sup>28</sup>. The exact methodology is described in a memorandum to the MBTA (July 1997).

### Survey Team Shift Schedules

A random sample of surface Green Line trips needed to be surveyed. Since Green Line trips operate both in the subway and on the surface and because only surface data were needed in this sample, it would have been inefficient to provide a randomly selected list of trips to be surveyed (such as is done for the bus system fare-mix survey sample). Instead, CTPS used a procedure that resulted in a random sample of surface trips without the pre-selection of trips, as described below.

In essence, the procedure required that outbound trips begin at Copley Station and that survey teams board the first outbound train, regardless of the line. The teams were instructed to perform an outbound survey for the surface portion of that trip, and, after disembarking at the end of the trip, perform a

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<sup>28</sup>See MBTA Supplemental Draft Environmental Impact Report on the 1991 Fare Increase, January 1993.

fare-mix survey on the surface portion of the next inbound trip on that line back to Copley. At Copley, they were then to take the next train outbound and continue surveying in that fashion until the end of their shift. Sampling was also scheduled so that an equal number of inbound and outbound trips were sampled. This procedure would in theory provide an unbiased distribution of trips by line.

An adequate distribution of trips by time of day was also required. An examination of the Green Line schedule showed that the scheduled number of trips per hour between 6:00 AM and 7:00 PM was about twice as great than at other times of the day. Because the number of trips sampled per hour using CTPS' suggested method did not vary according to trip frequency, it was expected that the number of trips per hour surveyed by each team would not vary by time of day. Therefore, to ensure that a representative sample of trips is surveyed, CTPS suggested that checker coverage be twice as dense during the 6:00 AM to 7:00 PM time period than during other times. To accomplish this, twice as many survey teams *per hour or shift* would be scheduled during the 6:00 AM to 7:00 PM time period than during other times.<sup>29</sup> The same approach was used on weekends, however, fewer trips were surveyed.

### Survey Procedure

Survey instructions, which included sample survey forms, were forwarded to MBTA supervisors. The survey forms are shown in Appendix A. Eight-barrel hand-held counters were also distributed.

Survey teams were comprised of two crew members: one observer, and one recorder. With the exception of trips starting at Lechmere, most survey shifts started at Copley Station, where the survey team was supposed to board the first outbound train, regardless of line, and performed an *outbound* survey.

In the outbound direction, the survey team counted and recorded the number of passengers on-board immediately after the car left the last underground station. For E line trips, the beginning onboard passenger count was recorded right after Symphony and before the first surface stop. For B, C, and D line trains, the beginning onboard passenger count had to be recorded right after the Kenmore stop, and before the first surface stop.<sup>30</sup> Because no fares are collected in the outbound direction, no farebox data was recorded. After the train reached the surface, passengers boarding on the surface portion of the trip were counted and recorded. It was suggested that one person be in

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<sup>29</sup>This approach is not necessary in the future, since the stratification takes care of the above described problem.

<sup>30</sup>During periods when there were no token collectors at Prudential and Symphony, these two stations were treated as surface stops.

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

position at the front half of the car to count (using a hand-held counter) passengers boarding through the front and middle door, and the second person be in position to count passengers boarding through the rear door. At the end of the trip, the number of surface boarders counted by each surveyor was indicated in the authorized free category on the survey form: e.g. 19 (front) + 11 (rear) = 30 boarders. At the end of the outbound trip, survey teams took the first inbound trip on that line.

For an inbound trip, the survey team first recorded the trip identification and farebox information before the start of the trip, making sure that the operator ran down the farebox before recording the farebox register information and before any passengers boarded. Then, for the surface portion of the inbound trip, the method of fare payment for each boarder was recorded. One person kept an eye on boarders and the farebox, and called out the type of fare paid for each boarder; the second person recorded the information on the survey form. The survey team tried to position themselves so that they had an unobstructed view of boarding passengers. Immediately after the last surface stop, the team recorded the number of passengers on the vehicle and the ending farebox data (after the farebox had been run down). This information had to be recorded before the first underground stop. Surveying continued in this cyclical manner until the end of the survey shift. At the end of the shift survey teams went back to the station where they started.

Several other procedures were followed:

- Surveyors used a new blank form for each one-way trip, and recorded the appropriate trip identification information on each form: team members, day, date, car house, vehicle number, first, second, or third car, route number, direction, scheduled start time (if known), and actual survey start time. Different survey information was recorded for inbound and outbound surveys.
- On inbound trips, if it was determined before the trip started that the farebox register was not working properly, the survey team took the next inbound trip instead. If it was obvious that the farebox was not registering only after the trip started, the surveyors got off, went back to the end of the line, and took the next inbound train.
- At Copley, if two or more teams were waiting to board outbound trains at the same time, the teams boarded trains on a first-in/first-out basis.
- For two-car trains, teams alternated surveying the first or second car for inbound and outbound trips separately. For example, if the first car of a two-car train was surveyed on an outbound trip, the second car was surveyed the next time the team surveyed an outbound two-car train. Teams also alternated on inbound two-car train trips. Surveying one-car

trains in between two-car trips did not count as surveying the first car of a train for these purposes.

- Survey teams did not board outbound trains that were designated to terminate at Kenmore. If surveyor team unknowingly boarded a train that short-turned at Kenmore, they got off, and took the next outbound train.
- Surveyors on inbound Riverside trips put a large vertical slash in each fare category box after passing the Chestnut Hill station and before arriving at Reservoir, so that a distinction could be made between passengers who boarded before Reservoir, and were supposed to pay \$2.00, and those who boarded between Reservoir and Fenway Park, and were supposed to pay \$1.00.

### Fare Categories

For outbound trips all surface Green Line passengers are categorized as authorized free. For inbound trips there are seven methods of fare payment: adult cash fare (\$0.85 on all lines except the D Line, \$2.00 between Riverside and Chestnut Hill, and \$1.00 from Reservoir to Fenway), adult monthly pass (bus, subway, combo or higher), reduced fare for senior citizens and persons with disabilities (\$0.20), children fare (50% of adult fare: \$0.40 to \$1.00), student pass (free during school days until 6:00 PM), ten-ride tickets (between Riverside and Chestnut Hill) and Newton local coupon, authorized free (MBTA employees, or free guest on Sundays), as well as unauthorized free (fare evaders).

It was often difficult for the surveyor to accurately determine the fare category for boarding passengers for the following reasons: passengers don't always show the proper ID when depositing reduced fares; determining the fare category by observing the amount of change deposited is difficult; the farebox was not always run down between passengers; and it was sometimes difficult for the surveyor to get situated in a good location when he or she boarded the vehicle.

### Survey Coding and Processing

The survey forms were checked for accuracy and completeness by CTPS, and, if possible, corrections were made. The data on the forms were then keyed into a trip record data file. Separate trip record files were generated for each surface Green Line routes. The records are shown in Appendix B.

### Estimation of Fare Evasion Rate

In earlier fare-mix studies, farebox register readings were used to estimate the farebox deposit. Normally the fare evasion rate would be calculated by taking the difference of the estimated minimum farebox deposit (the number of passengers in each fare category multiplied by each category's fare level) and the actual farebox reading divided by the estimated farebox deposit. However, with the electronic fareboxes the basic farebox reading includes cash only, meaning that the "fare evasion" rate is about as high as the rate of token use on the surface Green Line, approximately 30%. With the lack of an exact number of token deposits by trip, it was impossible to calculate an exact fare evasion rate. Because the actual annual token deposits matched well to the estimated token deposit derived from the survey results and farebox readings, it was assumed that there were virtually no fare evaders on the surface Green Line. Thus the minimum farebox deposit figures were used for computing the average fares. It is recommended for future fare-mix studies to count token users in a separate category from passengers paying cash.

Table 5-7 summarizes the sample estimates of average fares for all routes of the surface Green Line. From 1992 to 1996, the average farebox deposit decreased weekends for all Green Line branches, and increased weekdays, except for the D Line. The D Line has the highest average farebox deposit, since it serves more than one fare zone. The B Line has the lowest average farebox deposit, closely followed by the C Line. The B Line has also the lowest ratio of round-trip to inbound average farebox deposit, which means it has the most outbound surface stop boardings; the E Line has the highest ratio and thus the smallest number of outbound surface stop boardings.

### Fare Category Proportions and Average Fares

In order to come up with an overall average fare for all routes of the surface Green Line as well as for the light rail system, the total farebox revenue and number of passengers for the surface and subway portions of the Green Line were combined in a weighted average (see Appendix B). The figures for the light rail system exclude the Mattapan High Speed Line, which was not surveyed in the Spring 1996 data collection effort due to the fact that virtually no fares are collected on board.

Table 5-8 shows the weighted average sample estimates of fare category proportions for the total surface Green Line and the light rail system. In general, the proportion of each fare category was very stable between 1992 and 1996. Only the number of cash payers decreased on the weekend while free trips increased. In 1996, the number of free boardings on the weekend is much higher than at weekdays, which is consistent with the subway Green Line result (see Table 5-3). Pass use is more common on weekdays than on

weekends. When surface Green Line is compared to the light rail system, the percentage for all fare categories except adult cash and free rides are similar. However, as expected, the light rail system has more cash payers and exactly as many fewer passengers who travel for free.

**Table 5-7**  
**Surface Green Line Average Fares in Dollars**

		<u>Avg. Farebox Deposit (Inbound)</u>	<u>Avg. Farebox Deposit (Round-Trip)</u>
<b><u>B Line:</u></b>	<b>Weekday</b>		
	April 1992	0.374	0.218
	Spring 1996	0.368 (6.7%)	0.226 (18.1%)
	<b>Weekend</b>		
	April 1992	0.424	0.281
	Spring 1996	0.441 (8.9%)	0.264 (8.7%)
	Week 1996	0.378 (5.6%)	0.235 (7.9%)
<b><u>C Line:</u></b>	<b>Weekday</b>		
	April 1992	0.344	0.243
	Spring 1996	0.328 (6.4%)	0.249 (10.6%)
	<b>Weekend</b>		
	April 1992	0.397	0.287 (7.1%)
	Spring 1996	0.390 (6.7%)	0.263
	Week 1996	0.341 (5.4%)	0.252 (8.9%)
<b><u>D Line:</u></b>	<b>Weekday</b>		
	April 1992	0.652	0.482
	Spring 1996	0.634 (7.5%)	0.440 (10.3%)
	<b>Weekend</b>		
	April 1992	0.871	0.681
	Spring 1996	0.888 (7.2%)	0.655 (13.5%)
	Week 1996	0.686 (6.1%)	0.482 (8.5%)
<b><u>E Line:</u></b>	<b>Weekday</b>		
	April 1992	0.357	0.292
	Spring 1996	0.385 (4.7%)	0.335 (5.4%)
	<b>Weekend</b>		
	April 1992	0.479	0.421
	Spring 1996	0.450 (6.8%)	0.392 (8.3%)
	Week 1996	0.400 (4.0%)	0.348 (4.6%)

(Note: Numbers in parentheses are the precision figures at the 95% confidence level.)



## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

The results for the average farebox deposit, the true average fare and the average pass ride value are shown in Table 5-9. The weekly and weekday average farebox deposit increased slightly between 1992 and 1996. The average fare is higher on the weekend than on weekdays. The average farebox deposit is also higher for the light rail system than for the surface Green Line, since the whole system has a lower percentage of free trips. The true average fare accounting for both cash and pass revenue is \$0.602.

**Table 5-8**  
**Surface Green Line and Light Rail Round-Trip**  
**Fare Category Proportions in Percentages**

		<u>Adult</u> <u>Cash</u>	<u>Adult</u> <u>Pass</u>	<u>Sen. Cit.</u> <u>&amp; Disabled</u>	<u>Child</u> <u>Half</u>	<u>Stud.</u> <u>Pass</u>	<u>Free</u>	<u>Other</u>
<b><u>Week:</u></b>	Surface GL							
	April 1992	31.2	33.0	3.6	0.7	0.6	30.8	—
	Spring 1996	30.3	32.6	4.0	1.0	1.2	30.8	0.2
	LR System 96	44.0	33.0	3.1	1.0	0.8	18.1	0.1
<b><u>Weekday:</u></b>	Surface GL							
	April 1992	29.5	31.9	4.0	0.7	0.7	33.1	—
	Spring 1996	29.9	34.0	4.2	1.1	1.4	29.3	0.2
	LR System 96	44.6	33.1	3.2	0.9	1.0	17.1	0.1
<b><u>Weekend:</u></b>	Surface GL							
	April 1992	38.1	27.4	4.6	1.0	0.0	28.9	—
	Spring 1996	32.5	25.8	3.1	0.5	0.1	37.8	0.2
	LR System 96	41.4	32.0	2.7	1.0	0.1	22.7	0.1

According to the average pass ride value of \$0.691, pass users receive a larger discount on the Green Line than on heavy rail. This is due to the fact that:

- Green Line pass users take more trips per week than heavy rail pass users (15.2 vs. 13).<sup>31</sup>
- the Green Line has fewer combo or combo plus pass riders than heavy rail.
- lower priced local bus passes account for 2.4% of all passes used on the Green Line.

<sup>31</sup>Derived from the results of the MBTA Systemwide Passenger Survey (1994).

**Table 5-9**  
**Surface Green Line and Light Rail Round-Trip Average Fares in Dollars**

		<u>Avg. Farebox Deposit</u>	<u>True Avg. Fare</u>	<u>Avg. Pass Ride Value</u>
<b><u>Week:</u></b>	<b>Surface Green Line</b>			
	Inbound only			
	Spring 1996	0.454 (3.6%)		
	Round-Trip			
	April 1992	0.312		
	Spring 1996	0.322 (4.5%)		
	Light Rail System 1996	0.413 (7.0%)	0.602	0.691 <sup>32</sup>
<b><u>Weekday:</u></b>	<b>Surface Green Line</b>			
	Inbound only			
	Spring 1996	0.433 (4.3%)		
	Round-Trip			
	April 1992	0.298		
	Furth Analysis 1992	0.289 (7.3%)		
	Spring 1996	0.307 (5.2%)		
	Light Rail System 1996	0.412 (7.9%)		
<b><u>Weekend:</u></b>	<b>Surface Green Line</b>			
	Inbound only			
	Spring 1996	0.531 (5.9%)		
	Round-Trip			
	April 1992	0.384		
	Spring 1996	0.380 (8.8%)		
	Light Rail System 1996	0.415 (14.3%)		

(Note: Numbers in parentheses are the precision figures at the 95% confidence level.)

### **BUS AND TRACKLESS TROLLEY**

Bus and trackless trolley fare proportion and average fare estimates were obtained by recording the type of fare paid for passengers boarding a sample of local, zoned, and express bus and trackless trolley trips. This section describes the sample design, the survey procedure, and survey data processing and analysis. A comparison between the current bus fare-mix survey procedures and the procedures used for previous fare-mix surveys is also presented.

<sup>32</sup>This figure excludes free outbound surface trips.

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

### Sample Design

In 1985, the MBTA began an ongoing bus and trackless trolley data collection program to satisfy annual FTA (then UMTA) Section 15 reporting requirements. This revenue-based sampling program is designed to generate estimates of annual bus and trackless trolley passengers and passenger-miles. The revenue based sampling procedure consists of counting boarding and alighting passengers, and farebox data, on 208 randomly selected one-way bus trips throughout the year, and developing estimates of farebox revenue per passenger and passenger-mile. Annual revenue estimates are then divided by the sample average revenue per passenger and revenue per passenger-mile estimates to obtain estimates of total annual bus and trackless trolley passengers and passenger-miles. The sample size of 208 bus trips is based on typical transit system variances for variables of interest and provides statistically significant values at the 95 percent confidence level with  $\pm 10$  percent precision.

Revenue-based procedures were used because they are efficient and statistically valid. Revenue-based procedures require the random selection of bus trips, as opposed to the random selection of bus passengers. Random selection of bus trips is easily to accomplish: bus trips are designated and can be selected easily from the population of all bus trips. Random selection of bus passengers is problematical: bus passengers are not labeled and there is no available list of them. Therefore it is difficult to select passengers in a manner that does not introduce bias. Revenue-based procedures rely on the theory that the data across the sample selected from the population is normally distributed with the sample mean approaching the population mean.

An adaptation of the Section 15 revenue-based sampling procedure was used in the fare-mix surveys to estimate the bus and trackless trolley average fare, riders by fare category, and total ridership. There were some differences between Section 15 and fare-mix procedures:

- Section 15 surveys are designed so that estimates of total passengers and passenger-miles are generated for each sample bus trip. In order to develop estimates of these variables, the surveyors count the number of boarding and alighting passengers at each stop. Different information was needed for the fare-mix surveys, specifically the number of riders by fare category. Therefore, the procedure was adjusted so that the surveyor counted only boardings for each trip, and denoted each passenger's method of fare payment. Alighting was not counted.
- Typically, Section 15 surveying is spread throughout the year; trips are sampled at the rate of four per week, resulting in the required annual total of 208 bus trips. In the case of the 1996 fare-mix study, average fares and

fare category proportions were derived from the survey performed in spring 1996, rather than spread over an entire year.

Prior to the survey period, a list of randomly selected bus and trackless trolley trips was generated. CTPS checkers performed the surveys on the buses. All together 210 bus trips were surveyed, 172 on weekdays and 38 on weekends. It should be noted that the sample trips were selected from a population of all bus and trackless trolley trips, including zoned and express buses (refer to Appendix A).

### **Survey Procedure**

The bus trip sample list was divided into pieces of work lasting between one and four hours. To perform the bus trip surveys, checkers were instructed to board the bus at the beginning of the designated bus trip; get situated in a spot where the type of fare paid could be seen; record the beginning farebox register readings and trip start time; record the type of fare paid by all boarding passengers; and record farebox register readings and the time at the end of the trip.

### **Survey Coding and Processing**

After completion of the surveys, the completed forms were checked against the sample list. The forms were then checked for accuracy and completeness, and, where possible, corrections were made. The data on the forms were then keyed into a data file.

In the resultant data file, each bus trip is represented by one bus trip data record, and each record comprises 24 data fields, representing the 24 items on the survey form. After data entry was completed, the data file was imported into a spreadsheet program. The spreadsheet was designed to calculate sample estimates of fare category proportions and average revenue per passenger. The records are documented in Appendix B.

### **Fare Category Proportions**

Bus passengers were categorized by one of seven methods of fare payment: adult cash fare (base fare: \$0.60, zoned buses: \$1.00 to \$1.50, and express buses: \$1.50 to 2.25), adult monthly pass, reduced fare for senior citizens and persons with disabilities (\$0.15), children fare (50% of adult fare: \$0.30 to \$1.10), student pass (free during school days until 6:00 PM), authorized free (MBTA employees, as well as passengers with free transfers on certain bus routes or free guests on Sundays), and unauthorized free (fare evaders).

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

It was often difficult for the surveyor to accurately determine the fare category for boarding passengers. Passengers don't always show the proper ID when depositing reduced fares, and determining the fare category by observing the amount of change deposited was also difficult, especially when passengers were boarding rapidly. Crowded buses also presented problems because it was sometimes difficult for the surveyor to get situated in a good location. This was especially true if the checker boarded a bus trip that was on the second leg of an interlined trip, or if there were passengers remaining on board from the previous trip.

Sample estimates of fare category proportions were generated by summing passengers across bus trip records, and dividing by the total number of passengers. The resulting fare category proportions are shown in Table 5-10. The percent of both adult cash and adult pass increased from 1992 to 1996, while reduced fare categories decreased. This is most likely a result of a sampling error and/or a failure of the data collectors to recognize how many riders were paying discounted fares. The fact that more people use passes than pay cash did not change over the last four years.

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**Table 5-10**  
**Bus and Trackless Trolley Fare Category Proportions in Percentages**

	Week		Weekday		Weekend	
	1992	1996	1992	1996	1992	1996
Adult Cash	35.8	38.8	35.8	38.8	38.4	38.9
Adult Pass	35.9	40.1	35.9	39.2	39.4	44.3
Senior Citizens & Disabled	11.4	6.9	11.4	6.7	13.7	7.7
Child Half	8.7	4.1	8.7	3.9	4.4	5.0
Student Pass	5.2	5.8	5.2	6.9	0.1	1.0
Free	3.2	4.3	3.1	4.6	4.0	3.2

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### Farebox Revenue on Sampled Trips

Farebox register readings were used to estimate the average farebox deposit, which was determined by dividing the amount of revenue collected on sampled trips by the number of passengers on sampled trips. The revenue is automatically registered by the farebox, with the exception of tokens, which were not recorded. This is not a real problem, since according to MBTA revenue audits, only 0.6% of bus riders use tokens. The average farebox deposit was then used in conjunction with total farebox revenue, again

excluding token revenue, to determine total ridership. (Token revenues were used, however, for the estimation of the true average fare.)

To provide a check for reasonableness of the farebox revenue for each trip, the spreadsheet was designed to generate an independent estimate of the minimum farebox revenue that should have been deposited for each bus trip record. An *estimated minimum farebox revenue* figure was generated by multiplying the number of passengers in each fare category by the each category's fare level. The estimated minimum fare revenue was then compared to the farebox readings. There were often differences between these figures, which were attributable to the following factors:

- The farebox misclassified some of the deposited coins.
- The operator forgot to run down the farebox prior to recording the readings.
- The surveyor did not accurately read the farebox.
- The surveyor was not able to accurately determine the fare category for boarding passengers, resulting in an inaccurate recording.
- Fare evasion occurs, since some passengers do not deposit the appropriate fare amount.
- For zoned routes, it is likely that the estimated minimum farebox revenue would be less than the estimated farebox revenue. Checkers cannot keep track of where passengers board and alight, and consequently the fare that should have been deposited. For lack of specific information related to average fares on zoned routes, the base fare for each fare category was used in the trip record spreadsheet to generate the estimated minimum farebox revenue for each bus trip record. It should be noted that there is more incentive for fare evasion on zoned routes—operators do not know where passengers will alight and therefore what the appropriate fare is at the time the fare is paid. Also, the higher fares make it easier to "shortchange" the farebox.

The bus trip record spreadsheet was designed to flag bus trips for which the farebox revenue differed from the estimated minimum farebox revenue by a significant amount. Given the likely source of the differences between the farebox revenue and the estimated minimum farebox revenue, it seemed more reasonable to expect the farebox revenue (as an approximation of the actual farebox revenue) to be lower than the estimated minimum rather than higher: passengers are more likely to evade the fare rather than to pay more than they should. Therefore, it was decided that the farebox revenue was unreasonable if it did not meet the following criteria:

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

- It was less than 80% or greater than 110% of the estimated minimum farebox revenue.

Throwing out all the unreasonable records would decrease the sample size and worsen the precision. Therefore it was decided to use the estimated minimum farebox revenue—reduced by an appropriate factor to account for fare evasion—as an approximation of the actual farebox revenue. The fare evasion rate was very low, approximately 3.7%. (It should be noted that the presence of checkers on the bus sample trips may have deterred some fare evasion. This may have resulted in a biased estimate of fare evasion rates.)

### Average Fares

Table 5-11 summarizes the average farebox deposit, comparing it to the 1992 values, and the true average fare.

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**Table 5-11**  
**Bus and Trackless Trolley Average Fares in Dollars**

		<u>Avg. Farebox Deposit</u>	<u>True Avg. Fare</u>	<u>Avg. Pass Ride Value</u>
<u>Week:</u>	April 1992	0.263		
	Spring 1996	0.249 (10.4%)	0.445	0.489
<u>Weekday:</u>	April 1992	0.261		
	Spring 1996	0.249 (12.1%)		
<u>Weekend:</u>	April 1992	0.277		
	Spring 1996	0.253 (19.1%)		

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(Note: Numbers in parentheses are the precision figures at the 95% confidence level.)

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The average farebox deposit decreased from 1992 to 1996 as a result of increased pass use. Even though more zoned and express buses with higher fares are in service on weekdays and, compared to the weekend, about the same percentage of passengers pay cash, the average fare is on weekends higher than on weekdays. For the total week, the true average fare, which includes both cash fare and pass revenue, is \$0.445, and the average pass ride value is \$0.489, showing that pass users are enjoying a significant discount, because of their frequent riding of MBTA buses.

## COMMUTER RAIL

### Methods of Fare Payment

Unlike other MBTA service modes, the commuter rail system uses neither fareboxes nor turnstiles for fare collection. Consequently, there are no farebox deposits *per se*. Commuter rail passengers pay their fares using passes and a variety of ticket forms. In past fare-mix studies, for comparability with other modes, farebox deposit for commuter rail has been defined as revenue derived from rides made using tickets. This revenue has been calculated by multiplying the number of rides made on a representative day with each ticket form by the price per ride with such a ticket, and summing the results for all ticket forms.

Tickets can be purchased at the downtown Boston commuter rail stations or at independent ticket agencies at scattered locations throughout the commuter rail service area. Single-ride, round-trip, and family-fare tickets can also be purchased on board trains. Twelve-ride tickets, priced the same as 10 full fares from the same zone, and 10-ride tickets, priced the same as 10 half fares, are sold only at off-train locations. Tickets for inter-zone trips (trips not to or through a station in Zone 1A or 1B or one of the downtown Boston stations) can only be purchased on board.

Tickets purchased on board are valid only on the date of sale, and are the only tickets for which revenue is accounted for by individual days. For ticket sales at stations and agencies only monthly totals are recorded. It is therefore necessary to use information from a combination of several sources to calculate the fare-mix for commuter rail.

### Information Sources for Fare Revenue

Information on commuter rail cash and pass sales and revenue is contained in the monthly revenue ridership report prepared for the MBTA by Amtrak. This report accounts for most passes and tickets sold in a given month, but does not show the days on they were actually used. It is also incomplete in three areas: Zone 1A through 2 pass sales, on-board ticket sales, and off-train Family and Group Fare sales.

Train audit reports, usually prepared two to four times a year, show the number of passengers, by fare payment method, using each inbound train on a sample weekday, Saturday, and Sunday. These are supposed to be for representative days, but when expanded by the number of weekdays and weekend days in the same month as the audit, and doubled to account for outbound ridership, they invariably predict far more riders in each ticket category than the number of fares sold. Therefore, although they are of some



## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

use in estimating weekend and weekday ridership splits, audit numbers cannot be used directly.

The methods used by CTPS to calculate ridership from the information in the revenue ridership reports are described below.

### Method of Ridership and Fare-Mix Calculation

Adjustments of Pass Sales Data: All commuter rail passes for Zone 1 or higher are also valid for up to maximum fares on all MBTA rapid transit, light rail, bus, and trackless trolley routes, except that a few express bus routes require cash in addition to a Zone 1 pass. On some express bus routes, the minimum pass option available for payment of full fare is the Zone 1 or Zone 2 pass, but commuter rail is the only mode on which a Zone 3 or higher pass is ever required. The Revenue Ridership reports include sales of all Zones 3 through 9 or Inter-zone passes, regardless of sales location. Zone 1 and 2 passes are included if they are sold at commuter rail stations or suburban ticket agencies, but not if sold through the employer pass program or at MBTA pass sales offices. Some Zone 1 and 2 passes purchased at railroad stations or agencies are used exclusively on express buses, but survey and available count results indicate that the number of these is much smaller than the number of Zone 1 and 2 passes purchased for commuter rail use through the employer pass program or through MBTA sales offices. Therefore, the revenue ridership report significantly understates Zone 1 and 2 pass ridership.

In ridership calculations for fare-mix studies, it is necessary to estimate the number of Zone 1 and 2 passes purchased for commuter rail use through the employer pass program or through MBTA sales offices. In this fare-mix study, these sales have been estimated by applying factors to Zone 1 and 2 pass sales at railroad stations and ticket agencies. The factors were based partly on the proportions of pass sales by location in zones for which the revenue ridership report totals are complete, and partly on the sales locations reported by pass users in the 1993 commuter rail passenger survey.

No passes are issued specifically for commuter rail Zone 1A or 1B, but all passes other than the local bus pass are valid at stations in these zones. The least costly pass option for a Zone 1A or 1B rider is the Subway pass. The number of Subway, Combo, and Combo Plus passes sold at railroad stations and ticket agencies alone greatly exceeds total ridership at all Zone 1A and 1B commuter rail stations. Revenue ridership reports do not allocate any of these pass sales to the commuter rail system, but survey results show that the vast majority of Zone 1A and 1B passengers are pass users. Therefore, ticket sales reports alone significantly understate Zone 1A and 1B ridership.

For purposes of fare-mix ridership calculations starting with 1993, sales of passes for Zone 1A and 1B commuter rail use have been estimated on the basis of special passenger counts made at all Zone 1A and 1B stations by CTPS in the fall of 1994. Average daily Zone 1A and 1B ridership using tickets was calculated from sales figures in revenue ridership reports and subtracted from the passenger count totals to find pass totals. (Subsequent counts at selected stations show little change in Zone 1A and 1B ridership since 1994.)

Adjustments of On-Board Ticket Sales Data: In the revenue ridership reports, each on-board ticket sale is reported as one passenger trip sale. This substantially understates ridership from on-board sales, as an on-board ticket may be issued for a round trip, or for several passengers making one-way or round trips. The maximum number of passenger trips that can be sold on one ticket is ten (a round-trip ticket for five passengers).

To determine more accurate factors for rides sold using on-board tickets, CTPS obtained the actual conductors' ticket receipts for on-board sales for one weekday, one Saturday, and one Sunday in October 1994. Tallies were then made of the trips for which these tickets were punched, separated by endpoints, fare category, and number of riders. It was found that the average on-board ticket accounted for 1.35 passenger trips on the weekday, 1.71 on the Saturday, and 1.65 on the Sunday, excluding tickets for special trains to Foxboro Stadium.

Using the tallies of ride sales by category and the fares applicable to each ride, average revenue per ticket was calculated separately for the weekday, Saturday, and Sunday samples. Because of a higher incidence of passengers traveling together on one ticket on weekends, average revenue for on-board tickets was significantly higher on weekends (\$4.56 Saturday, \$4.45 Sunday) than on weekdays (\$3.39). The weekday figure includes surcharges for on-board purchases, when collected; surcharges are not applicable on weekends. Overall on-board ticket sales produced average revenue of \$3.67 per ticket in September 1993, \$3.65 in April 1994, and \$3.77 in March 1996. The revenue averages for the October 1994 sample days were assumed to be representative of weekdays, Saturdays, and Sundays for 1993, 1994, and 1996 in general. Simple algebraic formulas were then used to estimate the relative numbers of weekday and weekend sales needed to yield the overall reported averages for months used in the fare-mix studies.

Adjustment of Family and Group-Fare Sales Data: A family-fare ticket allows two adults to make a round trip with up to three children for the price of two adult round trips, or for the price of one adult round trip if a pass is presented. About 80% of family fares are sold on board trains and are included in overall on-board ticket sales. In the revenue ridership reports, off-train sales of family fares are reported separately for each railroad station and ticket agency. Those sold at South Station or Back Bay show the number of passengers for

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

which they are issued, by zone. These numbers must be doubled to find total ride sales. Reports from suburban ticket agencies show total family fare sales but not the number of passengers per ticket. For purposes of fare-mix ridership calculations, it is assumed that the average number of riders per family-fare ticket for agency sales in each zone is the same as that for on-board sales from the same zone. (The latter figure is based on the 1994 on-board ticket sales sample.)

Family-fare ticket sales for North Station in the revenue ridership reports are combined with group fare sales, such as for school field trips in the breakdowns of sales by zone, and in the overall summary. Breakdowns of ticket sales by seller show total sales of group tickets, total group ticket passengers and total revenue from these sales. They do not show the number of zones traveled or the mix of full and half-fare passengers in groups. Large month-to-month variations in group ticket sales indicate that they are for non-repetitive trips, but they account for at most 0.25% of total monthly ridership. For these reasons, group ticket sales (as well as sales of tickets for special trains to Foxboro Stadium) were excluded from the ridership analysis.

Revenue Allocation Between Weekdays and Weekends: As noted above, the Revenue Ridership Reports show ticket and pass sales and revenue by month, but do not show when these tickets and passes were used. The tallies of on-board ticket sales made by CTPS for October 1994 sample days provided factors for separating on-board sales totals into weekday and weekend ridership by fare category. Off-train sales were separated as described below.

Tickets/Cash Fares: In the revenue ridership reports, off-train ticket sales are broken down into five categories: One-way (full fares), half fare, 10-ride, 12-ride, and family fares. Round-trip tickets are issued only for the special trains to Foxboro Stadium. Otherwise, passengers requesting round-trip tickets are sold two one-way tickets. Half-fare and 10-ride tickets are sold to four categories of riders: senior citizens, disabled, children under 12, and students (high school or younger). The fare-mix study calls for separation of reduced fares into senior/disabled and child/student, but the revenue ridership reports do not show reduced fare sales by sub-category.

Ticket audit reports were done for September 1993, and March 1996, but the report nearest to April 1994 was for May 1994. To estimate the splits of weekend and weekday off-train ticket sales, the audit day figures for each year were first summarized on a zone-by-zone basis for each fare category. Since the audit figures included inbound trains only, they were doubled to approximate two-way ridership. The results were multiplied by the number of weekdays, Saturdays, and Sundays in each month. In the 1993 figures, Labor Day was assumed to have characteristics closest to those of a Sunday. Projections for April 1994 were made using the May audit figures, with adjustments for Easter and Patriot's Day. In the 1996 figures, Evacuation Day,

a holiday for some public employees, was assumed to have characteristics closest to those of a normal weekday.

The expanded audit figures for each fare category were next compared with the ticket sales totals shown in the corresponding revenue ridership reports. Audit report figures do not distinguish between on-board and off-train ticket sales. One-way full and half fares, and family fares can be purchased either on or off trains, but 10-ride and 12-ride tickets are only sold off-train. To compare one-way, half-fare and family fare sales with audit projections, off-train sales figures for each zone were taken directly from the revenue ridership reports. These were added to on-board sales by zone, calculated by applying factors derived from the October 1994 on-board ticket sample to the total reported on-board sales.

Audit reports are supposed to show results for typical days. When projected to full months, however they show far more riders in most ticket categories than can be accounted for by ticket sales. This indicates either that ridership is unusually high on the audit days, that it is grossly over-reported, or that a large proportion of ticket sales are unaccounted for. Of these, the third possibility is the least likely.

For full fare one-way trips, ticket sales accounted for only 65% of projected audit totals for September 1993, 64% for April 1994, and 54% for March 1996. The discrepancy for half-fares was even greater, at 46%, 47%, and 47%. Family fares had an 81% ratio for 1993, but only 54% for 1994 and only 16% for 1996. (Half fare and family fare ridership is largely non-repetitive, so results from a single day can vary substantially from the monthly averages.)

Comparisons of sales and audit projections for 10-ride and 12-ride tickets were based entirely on off-train sales figures. Ticket sales for each form were multiplied by the number of rides for which the ticket was valid. Sales for 10-ride tickets accounted for only 33% of the number of rides on such tickets projected from Audit figures for 1993, 31% for 1994, and 38% for 1996. (Again, this may reflect the non-repetitive nature of many reduced-fare trips.) For 12-ride tickets, the ratio was 63% in 1993 and 1994 but only 57% in 1996.

In fare-mix analyses for years prior to 1993 it was assumed that although overall audit figures were too high, the proportions of weekday and weekend ridership were probably reasonable. When uniform adjustment factors were applied to the 1993 and later audit projections, it was found that in most zones, adjusted weekend ridership on one-way full fare tickets was less than the estimate of on-board ride sales alone from revenue data. Therefore, it was decided to apply most of the adjustment to weekday ridership and use weekend full fares as projected from the audits. This resulted in average reductions of 50% in the 1993 weekday figures, 53% in the 1994 figures, and 62% in the 1996 figures compared with audit projections.

## 5. SAMPLING PROGRAM, DATA COLLECTION AND RESULTS OF ANALYSIS

Similarly, most of the reductions in the audit projections of rides on half-fare and multiple-ride tickets were applied to weekday ridership. Sub-splits of half fare ridership into senior citizens and persons with disabilities and children/students were based on the splits in the audit reports, as these were reasonably consistent with the splits found in the on-board ticket samples.

About 80% of all family-fare tickets are sold on board trains. In the 1993 results, the audit projections for Weekday and Sunday family fare rides were close to the estimated totals for on-board sales alone. This implied that most Family fares sold off-train were used on Saturdays. For the fare-mix analyses for all three years, weekday and Sunday family fare totals were taken directly from the on-board estimates. Saturday figures were calculated by adding Saturday on-board sales estimates to total monthly off-train family fare sales. Family fares account for under 0.2% of weekday ridership, so assumptions about allocation of off-train Family fare sales have an insignificant impact on average fare estimates.

Because of changes in the calculation methods, weekend ridership shown in fare-mix calculations for 1993 and later years appears to have increased dramatically compared with earlier reports. In reality, this is mostly the result of corrections for allocation formulas that formerly credited too little ridership to weekends.

Passes: The 1993 commuter rail survey included a question on the number of days per week that passengers usually use commuter rail. The responses to this question from pass holders provided a means of estimating the percentage of issued passes that are used on an average weekday. The frequency of use question did not ask which days of the week passengers used the service. Estimates of the weekday pass use are maximized by assuming that riders traveling five days a week or less make all their trips on weekdays. In that case, the number of passes used on a given weekday is obtained by weighting five-day users by 1.0, four-day users by 0.8, etc.

Passengers using passes five days a week or less could actually use them for a combination of weekdays and weekend days (such as four weekdays and one Saturday,) but such patterns are probably uncommon. Audit figures, which are more likely to overstate than understate ridership, indicate that under 12% of outstanding commuter rail passes are used on Saturdays, and under 6% on Sundays.

The survey did not ask how many trips per day passengers made on commuter rail. Passengers using commuter rail for travel in only one direction each day would be unlikely to purchase passes, as they would not be cost-effective. Because of the relatively long trip distances served by commuter rail, very few passengers would have time or reason to make more than one round trip per day on any one line. The 1993 survey results showed

that only about 0.5% of all commuter rail riders made trips involving two commuter rail lines. For these reasons, it was assumed that average weekday pass ridership was equal to twice the number of issued passes that were used on a typical weekday.

The survey results indicated that only 3.3% of pass holders usually used commuter rail six days per week, and that only 0.6% usually used it seven days per week. These figures probably understate the percentages of issued passes used on weekends. First, as noted above, use on five days per week or less could include one or two weekend days. Second, the question did not ask pass holders how often they rode on weekends, but how many days per week they usually used commuter rail. A passenger using commuter rail on less than half of all weekends would be likely to consider that this was not "usually." Most months have eight or nine weekend days. If the average pass holder used commuter rail on only one weekend day per month, then an average of 11 to 12 percent of all issued passes would be used on an average weekend day. This is closer to the audit figures than to the survey figures. Lacking better information, the audit figures for Saturday and Sunday pass use, doubled for two-way travel, were used in the fare-mix analysis.

#### Fare Category Proportions and Average Fares

Tables 5-12 and 5-13 summarize the results of the fare-mix analyses for September 1993 and March 1996.<sup>33</sup> The results for the two years shown differ only slightly. Pass use among commuter rail riders is much higher

**Table 5-12**  
**Commuter Rail Fare Category Proportions in Percentages**

	<u>Week</u>		<u>Weekday</u>		<u>Weekend</u>	
	<u>1993</u>	<u>1996</u>	<u>1993</u>	<u>1996</u>	<u>1993</u>	<u>1996</u>
Adult Cash	35.5	34.8	32.4	31.4	66.5	66.6
Adult Pass	59.2	60.2	63.0	64.0	20.4	24.5
Senior Citizens & Disabled	3.2	3.0	2.8	2.9	7.2	4.2
Child/Student Half	1.3	1.2	0.9	0.9	5.3	4.1
Free	0.9	0.8	0.9	0.8	0.7	0.6

<sup>33</sup>Results of a 1992 commuter rail fare-mix analysis are not directly comparable with these, because of changes in the calculation methods.

than that on any of the other MBTA modes, at around 60%. This is probably the result of many different factors, including higher proportions of commuter rail riders making daily trips and lower proportions of commuter rail riders eligible for half fares. The 1993 survey results show that about 40% of commuter rail pass riders transfer to or from another MBTA service, further increasing the savings from pass use.

Table 5-13  
Commuter Rail Average Fare in Dollars

		<u>Avg. Farebox Deposit</u>	<u>True Avg. Fare</u>	<u>Avg. Pass Ride Value</u>
<u>Week:</u>	September 1993	1.081	2.161	1.825
	March 1996	1.062	2.386	2.196
<u>Weekday:</u>	September 1993	0.948		
	March 1996	0.921		
<u>Weekend:</u>	September 1993	2.429		
	March 1996	2.398		

The largest differences between the 1993 and 1996 results were in weekend pass use, which increased from 20.4% to 24.5% and in weekend ridership among senior citizens and persons with disabilities, which decreased from 7.2% to 4.2%. These differences may have resulted more from random variation in ridership between the audit days used in the weekend calculations than from overall trends.

Table 5-13 indicates that the weekly farebox deposit decreased from \$1.081 to \$1.062 between 1993 and 1996. In the same interval, the true average fare increased from \$2.161 to \$2.386 and the average pass value increased from \$1.825 to \$2.196. The underlying data show more rapid growth in ridership among pass users (9%) than among ticket users (4%). This resulted in greater growth in total ridership than in ticket revenue, and the consequent decrease in average farebox deposit. The increases in true average fare and in average pass value were results of greater growth rates in ridership in the higher fare zones. Overall weekly ridership increased by 7% from 1993 to 1996. Gains in Zones 4 through 8 ranged from 7% to 22%, but changes in Zones 1A through 3 ranged from a loss of 3% to a gain of 6%. Zone 9 showed a 53% ridership

gain, mostly as the result of implementation of Worcester service in September 1994.

### REVENUE FIGURES AND ESTIMATION OF RIDERSHIP

Revenue figures are necessary in order to estimate passenger boardings. The following monthly revenue data are available from the MBTA Revenue Department: rapid transit stations token sales are reported, which neither means that these tokens are used in the same month nor for the rapid transit; cash fares and tokens redeemed are collected separately for the surface Green Line and bus; monthly pass revenue is available by pass type. The MBTA Daily Revenue Summaries, used in the 1992 *Fare-Mix Study*, are not produced anymore, thus it is not possible to estimate ridership figures for weekdays and the weekend separately.

Passenger boardings for each system were estimated by dividing total system farebox revenue by the average system farebox deposit. In order to come up with passenger boardings by week, needed to compare the results with the April 1992 figures, the annual ridership is first calculated and then divided by 52<sup>34</sup>. This approach is described in Chapter 4, Formula 2, and an example is shown in Box 4-1. It is important to mention that the boardings shown in Table 5-14 are linked trips, attributed to the system where the trip begins. That is, 100,000 light rail trip boardings could include, say 20,000 transfers to heavy rail, which are not accounted for in the heavy rail figure. Thus, the 100,000 light rail trip boardings represent 120,000 unlinked trips (100,000 light rail and 20,000 heavy rail trips).

Table 5-14 exhibits passenger boardings and revenue from the farebox and pass sales. Altogether, in 1996 the MBTA had over 4.9 million weekly boardings. Even though for the core system (the whole system, except commuter rail) total boardings decreased by more than 90,000 boardings per week (2%), farebox revenue increased by 3.2%. Commuter rail boardings increased between 1993 and 1996 by 6.6%. Rapid transit boardings were essentially unchanged,<sup>35</sup> while the surface Green Line showed a slight increase. The bus system exhibited a significant drop (5%), continuing a long standing trend of declining ridership. In 1996, the bus system moved the most passengers (1.85 million per week), followed by heavy rail (1.66 million per week), light rail (0.98 million per week) and commuter rail (0.43 million per week).

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<sup>34</sup>The division of the annual data by 52 is reasonable, because the number of passenger boardings in spring is about the same as the average for the entire year; somewhat higher than the summer, but lower than the fall.

<sup>35</sup>The lack of an increase in rapid transit boardings and revenue is likely due to the 1992 figures being too high (see pp. 33-34).



**Table 5-14**  
**Weekly Passenger Boardings and Revenue by Mode**

	<u>Passenger Boardings</u>	<u>Total Revenue</u>	<u>Farebox Revenue</u>	<u>Pass Sales Revenue</u>
<b>Rapid Transit</b>				
April 1992	2,069,764	—	\$894,409	—
Furth Analysis 1992	2,014,435	—	—	—
Spring 1996	—	—	\$986,595	—
Unweighted	2,064,196	—	—	—
Weighted	2,067,637	—	—	—
<b>Heavy Rail System 1996</b>	1,659,533	\$1,352,114	\$769,100	\$583,014
<b>Surface Green Line</b>				
April 1992	531,473	—	\$166,018	—
Spring 1996	539,995	—	\$174,079	—
Mattapan HSL	30,500 <sup>36</sup>	—	—	—
<b>Light Rail System 1996</b>	978,599	\$570,921	\$391,574	\$179,347
<b>Bus System</b>				
April 1992	1,950,806	—	\$512,160	—
Spring 1996	1,853,128	\$825,167	\$461,682	\$363,485
<b>Core System</b>				
April 1992 <sup>37</sup>	4,496,714 <sup>38</sup>	\$2,476,187	\$1,572,587	\$903,600
Spring 1996 <sup>37</sup>	4,460,760	\$2,748,202	\$1,622,356	\$1,125,846
Incl. Mattapan HSL	4,491,260			
<b>Commuter Rail</b>				
September 1993 <sup>39</sup>	400,760	\$865,983	\$433,264	\$432,719
March 1996	427,133	\$1,018,994	\$453,506	\$565,488
<b>Total System</b>				
Spring 1996	4,918,393	\$3,767,196	2,075,862	1,691,334
Excl. Mattapan HSL	4,887,893	—	—	—

<sup>36</sup>The Mattapan High Speed Rail figure is based on a 1995 passenger count.

<sup>37</sup>Passenger boardings do not include passenger boardings on the Mattapan High Speed Trolley.

<sup>38</sup>Uses the ridership value derived from P. Furth's 1992 average farebox figure, which is corrected for the error causing rapid transit ridership in the 1992 *Fare-Mix Study* to be too high (see pp. 33-34).

<sup>39</sup>This figure is for 1993, since the equivalent commuter rail data are not available for 1992.



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## **Appendix A: Survey Forms and Sample Lists/Schedules**

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This appendix contains:

1. The survey forms used in the 1996 fare-mix survey, presented in the following order:
  - Heavy Rail and subway Green Line
  - Surface Green Line
  - Bus and trackless trolley
  
2. The sample lists and schedules for rapid transit, presented in the following order:
  - Heavy Rail and subway Green Line
  - Surface Green Line
  - Bus and trackless trolley

Not all scheduled trips were surveyed or used for the analysis. The ones which were used are shown as records in Appendix B.

**1996 Fare-Mix Study**  
**Rapid Transit Turnstile Test Form**

**Shift Identification Information**

Station _____	Location _____
Surveyor(s) _____	Day _____
_____	Date _____
Scheduled Start Time _____	Scheduled End Time _____

**Instructions: Test each turnstile separately. Note the type of test performed: actual passenger (pax) or quick test. For actual pax count test:**

1. Record beginning time, turnstile, and pass register reading (if turnstile has a passreader).
2. Using manual denominator, record pass and token users through turnstile (for either 5 minutes or ten passengers).
3. Record ending time, turnstile and pass register reading.
4. For both register and manual readings, subtract end figures from begin figures and enter in spaces for totals.
5. Compare register and manual totals. If they match the registers are OK. If they don't match, they are not functioning properly.

**Turnstile Tests**

Turnstile ID Number	Type of Test		Time	Register Reading			Manual Count			Reg-isters OK?
				Turnstile	Pass	Token	Turnstile	Pass	Token	
	<input type="checkbox"/> Pax	Begin	AM PM							<input type="checkbox"/> Yes
		End	AM PM							
	<input type="checkbox"/> Quick	Total								<input type="checkbox"/> No
	<input type="checkbox"/> Pax	Begin	AM PM							<input type="checkbox"/> Yes
		End	AM PM							
	<input type="checkbox"/> Quick	Total								<input type="checkbox"/> No
	<input type="checkbox"/> Pax	Begin	AM PM							<input type="checkbox"/> Yes
		End	AM PM							
	<input type="checkbox"/> Quick	Total								<input type="checkbox"/> No
	<input type="checkbox"/> Pax	Begin	AM PM							<input type="checkbox"/> Yes
		End	AM PM							
	<input type="checkbox"/> Quick	Total								<input type="checkbox"/> No
	<input type="checkbox"/> Pax	Begin	AM PM							<input type="checkbox"/> Yes
		End	AM PM							
	<input type="checkbox"/> Quick	Total								<input type="checkbox"/> No

**1996 Fare-Mix Study**  
**Rapid Transit Turnstile Survey Form**

1

**Shift Identification Information**

Station <input style="width: 80%;" type="text"/>	2	Location <input style="width: 80%;" type="text"/>	3
		Day <input style="width: 80%;" type="text"/>	5
Surveyor <input style="width: 80%;" type="text"/>	4	Date <input style="width: 80%;" type="text"/>	6
Scheduled Start Time <input style="width: 80%;" type="text"/>	7	Scheduled End Time <input style="width: 80%;" type="text"/>	8
Actual Start Time <input style="width: 80%;" type="text"/>	9	Actual End Time <input style="width: 80%;" type="text"/>	10

1. From turnstile register test form, enter whether the count is automatic or manual for each turnstile.
2. For automatic survey: record beginning, intermediate and ending times, turnstile, and pass readings (if turnstile has pass reader) for each turnstile in the "Turnstile" and "Pass" rows.
3. For manual survey: record beginning, intermediate and ending times. Then, using denominator, record the number of pass and token riders passing through the turnstile. Record the beginning, intermediate and ending figures in the "Pass" and "Token" rows. (It may not be possible to keep track of all non-working turnstiles at the same time. Do as many as you can.)

**Turnstile Readings/Counts**

		Begin	Intermed	Intermed	Intermed	End	Comments
Turnstile ID Num:	Time:	AM PM	AM PM	AM PM	AM PM	AM PM	
	Turnstile Readings:						
Test:	Pass Readings:						
	Token Readings:						
Turnstile ID Num:	Time:	AM PM	AM PM	AM PM	AM PM	AM PM	
	Turnstile Readings:						
Test:	Pass Readings:						
	Token Readings:						
Turnstile ID Num:	Time:	AM PM	AM PM	AM PM	AM PM	AM PM	
	Turnstile Readings:						
Test:	Pass Readings:						
	Token Readings:						

23

24

25

**1996 Fare-Mix Study**  
**Rapid Transit Collector's Turnstile Survey Form**

1

**Shift Identification Information**

Station _____ 2	Location _____ 3
Day _____ 5	
Surveyor _____ 4	Date _____ 6
Scheduled Start Time _____ 7	Scheduled End Time _____ 8
Actual Start Time _____ 9	Actual End Time _____ 10

**Collector's Farebox Readings**

*Note: Run down farebox at beginning and end of each trip before recording gatebox readings.*

Collector's Box #: \_\_\_\_\_ 11

	Begin	Intermediate	Intermediate	Intermediate	End	
Time:	AM PM	AM PM	AM PM	AM PM	AM PM	Comments
Cash:	12				13	
Tokens:	14				15	
Pennies	16				17	
Controller					18	

**Passengers Passing through Collector's Turnstile**

		Begin	Intermed	Intermed	Intermed	End	
	Time:	AM PM	AM PM	AM PM	AM PM	AM PM	Comments
Adult	Cash						18
	Pass						19
E & H	Reduced						20
Children & Student	1/2 Fare						21
	Pass						22
Free	Authorized						23
	Non-Authorized						24

**1996 Fare-Mix Study  
Surface Green Line Survey Form**

**Trip Identification Information**

Route # _____ 2 <input type="text"/>	Direction: <input type="checkbox"/> In <input type="checkbox"/> Out 3 <input type="text"/>
Observer _____ 4 <input type="text"/>	Day: _____ 6 <input type="text"/>
Recorder _____ 5 <input type="text"/>	Date: _____ 7
Vehicle # _____ 9	Survey Start Time _____ 8
Car: <input type="checkbox"/> 1st <input type="checkbox"/> 2nd <input type="checkbox"/> 3rd 10 <input type="text"/>	

**Farebox Readings (Inbound trips only)**

*Note: Run down farebox at beginning and end of each trip before recording farebox readings.*

	Beginning Reading	Ending Reading
Cash:	11 <input type="text"/>	12 <input type="text"/>
Dollar bills received during trip:		13 <input type="text"/>

**Passenger Counts**

Adult	Cash	14 <input type="text"/>
	Pass	15 <input type="text"/>
E & H	Reduced	16 <input type="text"/>
Children & Student	1/2 Fare	17 <input type="text"/>
	Pass	18 <input type="text"/>
Free	Non-Authorized	19 <input type="text"/>
	Authorized	20 <input type="text"/>

**Portal Load Count**

<b>Inbound:</b> Pax on-board after last surface stop: 21 <input type="text"/>	<b>Outbound:</b> Pax on-board after last subway stop: 22 <input type="text"/>
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**1996 Fare-Mix Study**  
**Surface Green Line Survey Form - D LINE INBOUND ONLY**

**Trip Identification Information**

Route #	2 <input type="text"/>	Direction: <input type="checkbox"/> In <input type="checkbox"/> Out	3 <input type="text"/>
Observer	4 <input type="text"/>	Day:	6 <input type="text"/>
Recorder	5 <input type="text"/>	Date:	7 <input type="text"/>
Vehicle #	9 <input type="text"/>	Survey Start Time	8 <input type="text"/>
Car:	<input type="checkbox"/> 1st <input type="checkbox"/> 2nd <input type="checkbox"/> 3rd	10 <input type="text"/>	

**Farebox Readings (Inbound trips only)**

*Note: Run down farebox at beginning and end of each trip before recording farebox readings.*

	Beginning Reading	Ending Reading
Cash:	11 <input type="text"/>	12 <input type="text"/>
Dollar bills received during trip:		13 <input type="text"/>

**Passenger Counts**

*Note: For inbound Riverside trips, put vertical line in all fare categories after passing Chestnut Hill*

Adult	Cash	14 <input type="text"/>
	Pass	15 <input type="text"/>
	10-Ride Ticket (D Line)	16 <input type="text"/>
	Cash + Newton Local Coupon	17 <input type="text"/>
E & H	Reduced	18 <input type="text"/>
Children & Student	1/2 Fare	19 <input type="text"/>
	Pass	20 <input type="text"/>
Free	Non-Authorized	21 <input type="text"/>

**Portal Load Count**

Inbound: Pax on-board after last surface stop:	22 <input type="text"/>	Outbound: Pax on-board after last subway stop:	23 <input type="text"/>
--	-------------------------	--	-------------------------



**1996 Fare-Mix Study  
Bus/Trackless Trolley Survey Form**

1

**Trip Identification Information**

Route # _____	2	Direction: <input type="checkbox"/> In <input type="checkbox"/> Out	3 <input type="text"/>
Garage _____	4 <input type="text"/>		
Bus # _____	5	Day: _____	6 <input type="text"/>
Surveyor: _____	8	Date: _____	7
Ride from: _____		To: _____	
Scheduled Departure Time _____	9	Actual Departure Time _____	10

**Passengers Remaining On-Board from Previous Trip:** 11

**Farebox Readings**

*Note: Run down farebox at beginning and end of each trip before recording farebox readings.*

	Beginning Reading	Ending Reading
Cash:	11	12
Dollar bills received during trip:		13

**Passenger Counts**

Adult	Cash	20 <input type="text"/>
	Pass	21 <input type="text"/>
E & H	Reduced	22 <input type="text"/>
Children & Student	1/2 Fare	23 <input type="text"/>
	Pass	24 <input type="text"/>
Transfers		25 <input type="text"/>
Short fare	Cash	26 <input type="text"/>
Free	Authorized	27 <input type="text"/>
	Non-Authorized	28 <input type="text"/>

Table A-1

Early Morning	AM Peak	Morning	Morning	Late Morning	Lunchtime	Afternoon	School	PM Peak	Evening	Evening	Evening	Night	Saturday	Sunday
6:00 AM - 7:00 AM Kendall (Inbound)	7:00 AM - 8:30 AM Community College	8:30 AM - 10:00 AM Downtown Crossing (Summer Street)	10:00 AM - 11:30 AM Slony Brook	11:30 AM - 1:00 PM Downtown Crossing (Winter Street)	1:00 PM - 2:30 PM Beachmont	2:30 PM - 4:00 PM State (Old State House)	4:00 PM - 6:00 PM Park Street (Westbound)	6:00 PM - 7:30 PM North Quincy (North)	7:30 PM - 9:00 PM Chinatown (Outbound)	9:00 PM - 10:30 PM Airport (Outbound)	10:30 PM - 12:30 AM Harvard (Church Street)	6:00 AM - 7:00 AM	6:00 AM - 7:00 AM	
Quincy Adams	Alewife (Main)	North Quincy (Busway)	Orient Heights	Ashmont	Government Center	Government Center	State (Old State House)	State (Old State House)	Park Street (Winter/Tremont Street)	Haymarket	South Station	North Station	Maverick	NONE
Maverick	Jackson Square	Porter	Government Center	Harvard (Main)	Braintree	Copley (Outbound)	Hynes Convention Center	Hynes Convention Center	Downtown Crossing (Summer Street)	Boylston (Outbound)	Quincy Adams	Park Street (Northbound)	7:00 AM - 8:30 AM	7:00 AM - 8:30 AM
	Harvard (Main)	Harvard (Main)	Quincy Center	Downtown Crossing (Summer Street)		JFKUMass	Downtown Crossing (Summer Street)	State (Water Street)	Government Center	Government Center	Malden Center		Mass Ave.	NONE
	Andrew	Central (Central)	Braintree	Braintree		Quincy Center	Downtown Crossing (Summer Street)	Park Street (Westbound)					6:30 AM - 10:00 AM	6:30 AM - 10:00 AM
	Fields Corner	Quincy Center				Potter	State (Water Street)						Central (Inbound)	Porter
	Asinout	Sullivan				Back Bay	JFKUMass						Sullivan	
	Davis	Malden Center				Fields Corner	Reverse Beach						10:00 AM - 11:30 AM	10:00 AM - 11:30 AM
	Quincy Adams	Back Bay				Arlington	Harvard (Main)						Government Center	Orient Heights
	Wellington	Forest Hills				Kennmore	Ruggles						11:30 AM - 1:00 PM	11:30 AM - 1:00 PM
	North Station	Maverick				Copley (Inbound)	NEMAC (Washington Street )						Downtown Crossing (Summer Street)	Downtown Crossing (Winter Street)
	Mass Ave						Aquarium						1:00 PM - 2:30 PM	1:00 PM - 2:30 PM
	Wollaston						South Station						Boylston (Inbound)	Malden Center
	Forest Hills						Central (Inbound)						Charles	Kennmore
	Wonderland												2:30 PM - 4:00 PM	2:30 PM - 4:00 PM
	Beachmont												State (Old State House)	Copley (Outbound)
													Arlington	Government Center
													Back Bay	Davis
													4:30 PM - 6:00 PM	4:00 PM - 6:00 PM
													Hynes Convention Center	Central (Inbound)
													Downtown Crossing (Winter Street)	State (Milk Street)
													Aquarium	Ruggles
													6:00 PM - 7:30 PM	6:00 PM - 7:30 PM
													Park Street (Westbound)	Park Street
													7:30 PM - 9:00 PM	7:30 PM - 9:00 PM
													Hammarket (Busway)	Airport
													9:00 PM - 10:30 PM	9:00 PM - 10:30 PM
													Malden Center	South Station
													10:30 PM - 12:00 AM	10:30 PM - 12:00 AM
													Harvard (Main)	NONE

**Table A-2**  
**Sample List and Schedule for Surface Green Line**

Assign #	Start Location/Branch	AM												PM												Assign Length
		5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1				
<b>Weekdays</b>																										
WD1	Boston College (Inbound B)	5:00AM											1:30PM									8.5				
WD2	Cleveland Circle (Inbound C)	5:00AM											1:30PM									8.5				
WD3	Riverside (Inbound D)	5:00AM											1:30PM									8.5				
WD4	Lechmere (Inbound E)	5:00AM											1:30PM									8.5				
WD5	Boston College (Inbound B)	5:00AM											1:30PM									8.5				
WD6	Boston College (Inbound B)	5:30AM											2:00PM									8.5				
WD7	Cleveland Circle (Inbound C)	5:30AM											2:00PM									8.5				
WD8	Riverside (Inbound D)	5:30AM											2:00PM									8.5				
WD9	Copley (1st outb B, C, D, or E)	5:30AM											2:00PM									8.5				
WD10	Boston College (Inbound B)	5:30AM											2:00PM									8.5				
WD11	Cleveland Circle (Inbound C)	6:00AM											2:30PM									8.5				
WD12	Riverside (Inbound D)	6:00AM											2:30PM									8.5				
WD13	Lechmere (Inbound E)	6:00AM											2:30PM									8.5				
WD14	Copley (1st outb B, C, D, or E)	6:00AM											2:30PM									8.5				
WD15	Copley (1st outb B, C, D, or E)	6:30AM											3:00PM									8.5				
WD16	Cleveland Circle (Inbound C)	6:00AM											2:30PM									8.5				
WD17	Riverside (Inbound D)	6:00AM											2:30PM									8.5				
WD18	Copley (1st outb B, C, D, or E)	6:00AM											2:30PM									8.5				
WD19	Copley (1st outb B, C, D, or E)	5:00AM											1:30PM									8.5				
WD20	Copley (1st outb B, C, D, or E)	6:30AM											3:00PM									8.5				
WD21	Boston College (Inbound B)												12:00N									8.5				
WD22	Cleveland Circle (Inbound C)												12:00N									8.5				
WD23	Riverside (Inbound D)												11:30AM									8.5				
WD24	Lechmere (Inbound E)***												12:00N									8.5				
WD25	Boston College (Inbound B)												12:30PM									8.5				
WD26	Boston College (Inbound B)												12:30PM									8.5				
WD27	Cleveland Circle (Inbound C)												12:30PM									8.5				
WD28	Riverside (Inbound D)												12:00N									8.5				
WD29	Riverside (Inbound D)												12:30PM									8.5				
WD30	Boston College (Inbound B)												1:00PM									8.5				
WD31	Cleveland Circle (Inbound C)												12:00N									8.5				
WD32	Riverside (Inbound D)												12:30PM									8.5				
WD33	Cleveland Circle (Inbound C)												12:30PM									8.5				
WD34	Copley (1st outb B, C, D, or E)												12:00N									8.5				
WD35	Copley (1st outb B, C, D, or E)												12:30PM									8.5				
WD36	Cleveland Circle (Inbound C)												12:30PM									8.5				
WD37	Riverside (Inbound D)												1:00PM									8.5				
WD38	Lechmere (Inbound E)												1:00PM									8.5				
WD39	Copley (1st outb B, C, D, or E)												12:30PM									8.5				
WD40	Copley (1st outb B, C, D, or E)												1:00PM									8.5				
WD41	Boston College (Inbound B)																					6.5				
WD42	Cleveland Circle (Inbound C)																					6.5				
WD43	Riverside (Inbound D)																					6.5				
WD44	Lechmere (Inbound E)																					6.5				
WD45	Copley (1st outb B, C, D, or E)																					6.5				
WD46	Boston College (Inbound B)																					6.5				
WD47	Cleveland Circle (Inbound C)																					6.5				
WD48	Riverside (Inbound D)																					6.5				
WD49	Lechmere (Inbound E)																					6.5				
WD50	Copley (1st outb B, C, D, or E)																					6.5				

411.5

**Table A-2 (cont.)**  
**Sample List and Schedule for Surface Green Line**

		AM												PM												Assign
Assign #	Start Location/Branch	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	Length			
<b>Saturday</b>																										
SAT1	Boston College (inbound B)																						7.0			
SAT2	Cleveland Circle (inbound C)																						7.0			
SAT3	Riverside (inbound D)																						7.0			
SAT4	Lechmere (inbound E)																						7.0			
SAT5	Copley (1st outb B, C, D, or E)																						7.0			
SAT6	Boston College (inbound B)																						7.0			
SAT7	Cleveland Circle (inbound C)																						7.0			
SAT8	Riverside (inbound D)																						7.0			
SAT9	Copley (1st outb B, C, D, or E)																						7.0			
SAT10	Copley (1st outb B, C, D, or E)																						7.0			
70.0																										
<b>Sunday</b>																										
SUN1	Riverside (inbound D)																						8.0			
SUN2	Lechmere (inbound E)***																						8.0			
SUN3	Boston College (inbound B)																						8.0			
SUN4	Cleveland Circle (inbound C)																						8.0			
SUN5	Copley (1st outb B, C, D, or E)																						6.5			
SUN6	Boston College (inbound B)																						8.0			
SUN7	Cleveland Circle (inbound C)																						8.0			
SUN8	Riverside (inbound D)																						8.0			
SUN9	Copley (1st outb B, C, D, or E)																						8.0			
SUN10	Copley (1st outb B, C, D, or E)																						7.0			
77.5																										

\*\*\*=Round trip Lechmere to North Station only. For assignment WD24, begin short-turn round trips at 4:00 PM. For assignment SUN2, begin short-turn round trips at 12:30PM and end at 4:30PM.

\*\*\*=Round trip Lechmere to North Station only. For assignment WD24, begin short-turn round trips at 4:00 PM. For assignment SUN2, begin short-turn round trips at 12:30PM and end at 4:30PM.

Total shifts = 70 (50 weekday, 10 Saturday, and 10 Sunday)

Total Assignment Hours = 559 (411.5 weekday, 70 Saturday, and 77.5 Sunday)

All assignments require two persons; therefore total person-hours = 1,118 (823 weekday, 140 Saturday, and 155 Sunday)

Assuming each assignment equals one person-day, then total person-days = 140 (100 weekday; 20 Saturday; 20 Sunday)

**Table A-3.1**  
**Weekday Sample List and Schedule**  
**for Bus and Trackless Trolley**

Day	Route	Direction	Time	Garage
WEEKDAY	1.0	1	5:10 AM	CABOT
WEEKDAY	1.0	1	10:48 AM	CABOT
WEEKDAY	1.0	1	4:37 PM	CABOT
WEEKDAY	1.0	1	9:35 PM	CABOT
WEEKDAY	1.0	0	6:10 AM	CABOT
WEEKDAY	1.0	0	3:57 PM	CABOT
WEEKDAY	1.0	0	10:07 PM	CABOT
WEEKDAY	7.1	1	8:40 AM	CABOT
WEEKDAY	7.1	0	4:45 PM	CABOT
WEEKDAY	7.2	1	8:25 PM	CABOT
WEEKDAY	7.3	1	5:19 PM	CABOT
WEEKDAY	9.0	1	2:00 PM	ALBANY
WEEKDAY	9.0	1	9:55 PM	CABOT
WEEKDAY	9.0	0	2:12 PM	ALBANY
WEEKDAY	9.0	0	9:55 PM	CABOT
WEEKDAY	10.9	1	7:00 PM	CABOT
WEEKDAY	10.9	0	1:20 PM	CABOT
WEEKDAY	10.9	0	5:28 PM	CABOT
WEEKDAY	10.9	0	6:53 PM	CABOT
WEEKDAY	11.3	1	8:26 AM	CABOT
WEEKDAY	11.3	1	4:48 PM	CABOT
WEEKDAY	11.3	1	6:24 PM	CABOT
WEEKDAY	15.1	1	8:30 PM	CABOT
WEEKDAY	16.5	0	9:18 AM	CABOT
WEEKDAY	17.0	0	11:50 AM	CABOT
WEEKDAY	17.0	0	7:00 PM	CABOT
WEEKDAY	18.0	0	1:00 PM	CABOT
WEEKDAY	19.0	0	8:08 AM	CABOT
WEEKDAY	21.0	0	7:50 PM	CABOT
WEEKDAY	22.0	0	8:35 AM	CABOT
WEEKDAY	22.0	0	1:41 PM	CABOT
WEEKDAY	23.0	1	11:20 AM	CABOT
WEEKDAY	23.0	1	11:10 PM	CABOT
WEEKDAY	23.0	0	7:35 AM	CABOT
WEEKDAY	23.0	0	7:40 AM	CABOT
WEEKDAY	23.0	0	4:00 PM	CABOT
WEEKDAY	26.1	0	5:30 PM	Bartlett
WEEKDAY	26.1	0	5:44 PM	Bartlett

**Table A-3.1 (cont.)**  
**Weekday Sample List and Schedule**  
**for Bus and Trackless Trolley**

Day	Route	Direction	Time	Garage
WEEKDAY	28.0	1	9:12 AM	Bartlett
WEEKDAY	28.0	0	7:41 AM	Bartlett
WEEKDAY	28.0	0	4:28 PM	Bartlett
WEEKDAY	28.0	0	6:20 PM	Bartlett
WEEKDAY	28.3	0	1:45 PM	Bartlett
WEEKDAY	29.5	0	8:59 AM	Bartlett
WEEKDAY	31.0	1	10:15 AM	Bartlett
WEEKDAY	31.0	0	5:30 AM	Bartlett
WEEKDAY	31.0	0	10:56 AM	Bartlett
WEEKDAY	32.0	0	5:56 AM	Bartlett
WEEKDAY	33.6	1	5:15 PM	Bartlett
WEEKDAY	34.0	1	9:10 PM	Bartlett
WEEKDAY	34.0	0	7:38 AM	Bartlett
WEEKDAY	34.0	0	10:00 AM	Bartlett
WEEKDAY	34.4	0	8:20 AM	Bartlett
WEEKDAY	35.1	0	3:30 PM	Bartlett
WEEKDAY	36.0	1	4:55 AM	Bartlett
WEEKDAY	36.8	1	3:35 PM	Bartlett
WEEKDAY	36.8	0	6:54 AM	Bartlett
WEEKDAY	37.0	1	7:25 PM	Bartlett
WEEKDAY	37.0	0	5:55 AM	Bartlett
WEEKDAY	37.0	0	6:55 PM	Bartlett
WEEKDAY	39.3	0	6:06 PM	Bartlett
WEEKDAY	40.0	1	7:30 AM	Bartlett
WEEKDAY	41.0	1	7:06 AM	Bartlett
WEEKDAY	41.0	0	7:24 AM	Bartlett
WEEKDAY	41.0	0	8:00 PM	Bartlett
WEEKDAY	42.0	1	6:40 AM	Bartlett
WEEKDAY	42.0	1	9:00 PM	Bartlett
WEEKDAY	42.1	0	2:03 PM	Bartlett
WEEKDAY	43.0	1	12:44 PM	CABOT
WEEKDAY	43.0	0	6:29 AM	CABOT
WEEKDAY	43.0	0	3:09 PM	CABOT
WEEKDAY	43.0	0	3:43 PM	CABOT
WEEKDAY	43.0	0	5:55 PM	CABOT
WEEKDAY	44.1	0	6:59 AM	CABOT
WEEKDAY	45.0	0	8:27 AM	CABOT
WEEKDAY	45.0	0	6:24 PM	CABOT

**Table A-3.1 (cont.)**  
**Weekday Sample List and Schedule**  
**for Bus and Trackless Trolley**

Day	Route	Direction	Time	Garage
WEEKDAY	46.0	1	1:00 PM	Bartlett
WEEKDAY	47.0	0	12:20 PM	ALBANY
WEEKDAY	47.0	0	5:36 PM	ALBANY
WEEKDAY	48.0	0	2:43 PM	Bartlett
WEEKDAY	49.0	1	6:00 AM	CABOT
WEEKDAY	49.0	1	7:03 AM	CABOT
WEEKDAY	49.0	1	4:49 PM	CABOT
WEEKDAY	49.0	1	5:13 PM	CABOT
WEEKDAY	49.0	0	2:49 PM	CABOT
WEEKDAY	49.0	0	4:26 PM	CABOT
WEEKDAY	51.0	0	3:13 PM	Bartlett
WEEKDAY	55.0	0	8:50 PM	CABOT
WEEKDAY	57.0	1	6:56 AM	ALBANY
WEEKDAY	57.0	0	11:27 AM	ALBANY
WEEKDAY	57.0	0	3:36 PM	ALBANY
WEEKDAY	57.0	0	8:10 PM	CABOT
WEEKDAY	57.1	0	8:01 AM	ALBANY
WEEKDAY	59.2	1	3:45 PM	ALBANY
WEEKDAY	59.2	0	3:00 PM	ALBANY
WEEKDAY	59.2	0	5:00 PM	ALBANY
WEEKDAY	60.0	1	11:30 PM	CABOT
WEEKDAY	60.0	0	11:50 AM	ALBANY
WEEKDAY	64.0	1	5:31 AM	Som/Charlestown
WEEKDAY	66.6	1	2:20 PM	CABOT
WEEKDAY	66.6	1	7:10 PM	CABOT
WEEKDAY	66.6	0	6:40 AM	CABOT
WEEKDAY	66.6	0	2:09 PM	CABOT
WEEKDAY	69.0	1	1:40 PM	Som/Charlestown
WEEKDAY	69.0	0	7:41 AM	Som/Charlestown
WEEKDAY	70.0	1	5:15 PM	Som/Charlestown
WEEKDAY	71.0	1	8:27 AM	North Cambridge
WEEKDAY	71.0	0	6:17 AM	North Cambridge
WEEKDAY	72.0	1	9:25 PM	North Cambridge
WEEKDAY	73.0	0	5:40 PM	North Cambridge
WEEKDAY	73.1	1	4:23 PM	North Cambridge
WEEKDAY	74.0	0	2:40 PM	Som/Charlestown
WEEKDAY	77.0	1	5:48 AM	Som/Charlestown
WEEKDAY	77.0	1	9:50 AM	Som/Charlestown

**Table A-3.1 (cont.)**  
**Weekday Sample List and Schedule**  
**for Bus and Trackless Trolley**

Day	Route	Direction	Time	Garage
WEEKDAY	77.1	1	3:50 PM	Som/Charlestown
WEEKDAY	77.1	0	5:57 PM	Som/Charlestown
WEEKDAY	77.3	0	7:38 AM	Som/Charlestown
WEEKDAY	79.0	1	1:05 PM	Som/Charlestown
WEEKDAY	79.0	0	12:15 PM	Som/Charlestown
WEEKDAY	80.0	1	8:30 PM	Som/Charlestown
WEEKDAY	80.0	0	8:25 AM	Som/Charlestown
WEEKDAY	83.1	1	5:30 PM	Som/Charlestown
WEEKDAY	85.0	1	11:20 AM	Som/Charlestown
WEEKDAY	85.0	1	12:05 PM	Som/Charlestown
WEEKDAY	85.0	0	11:00 AM	Som/Charlestown
WEEKDAY	87.2	1	8:38 AM	Som/Charlestown
WEEKDAY	88.0	0	8:50 PM	Som/Charlestown
WEEKDAY	90.0	1	8:05 AM	Charlestown
WEEKDAY	90.0	1	7:30 PM	Charlestown
WEEKDAY	92.3	1	7:50 AM	Charlestown
WEEKDAY	92.3	0	5:10 PM	Charlestown
WEEKDAY	93.1	1	2:30 PM	Charlestown
WEEKDAY	93.1	0	2:39 PM	Charlestown
WEEKDAY	95.0	0	5:15 PM	Fellsway
WEEKDAY	95.0	0	9:30 PM	Charlestown
WEEKDAY	101.3	1	7:30 AM	Fellsway
WEEKDAY	104.0	1	1:25 PM	Charlestown
WEEKDAY	104.0	0	6:22 PM	Charlestown
WEEKDAY	105.1	1	4:00 PM	Fellsway
WEEKDAY	105.1	0	12:35 PM	Fellsway
WEEKDAY	109.0	1	7:46 AM	Charlestown
WEEKDAY	109.0	0	6:41 AM	Charlestown
WEEKDAY	111.5	1	8:06 AM	Charlestown
WEEKDAY	111.5	1	12:40 PM	Charlestown
WEEKDAY	111.5	0	7:22 AM	Charlestown
WEEKDAY	111.5	0	12:20 PM	Charlestown
WEEKDAY	111.5	0	6:38 PM	Charlestown
WEEKDAY	116.4	1	6:50 AM	Lynn
WEEKDAY	136.5	0	6:30 PM	Fellsway
WEEKDAY	210.3	0	8:40 AM	Quincy
WEEKDAY	211.0	1	5:30 PM	Quincy
WEEKDAY	216.0	0	10:40 AM	Quincy



**Table A-3.1 (cont.)**  
**Weekday Sample List and Schedule**  
**for Bus and Trackless Trolley**

Day	Route	Direction	Time	Garage
WEEKDAY	216.2	0	9:20 PM	Quincy
WEEKDAY	220.3	0	9:00 PM	Quincy
WEEKDAY	220.4	1	5:10 PM	Quincy
WEEKDAY	222.0	0	6:55 AM	Quincy
WEEKDAY	222.0	0	10:30 PM	Quincy
WEEKDAY	225.0	1	5:25 AM	Quincy
WEEKDAY	225.1	1	8:05 AM	Quincy
WEEKDAY	225.1	0	6:55 AM	Quincy
WEEKDAY	230.3	1	6:15 AM	Quincy
WEEKDAY	230.3	1	6:30 PM	Quincy
WEEKDAY	230.3	0	6:10 PM	Quincy
WEEKDAY	236.2	0	11:40 AM	Quincy
WEEKDAY	240.0	1	7:00 AM	Quincy
WEEKDAY	240.0	1	4:20 PM	Quincy
WEEKDAY	240.1	0	2:30 PM	Quincy
WEEKDAY	245.5	0	4:30 PM	Quincy
WEEKDAY	301.1	0	5:12 PM	ALBANY
WEEKDAY	302.0	1	8:07 AM	ALBANY
WEEKDAY	304.0	0	5:06 PM	ALBANY
WEEKDAY	304.0	0	7:48 PM	CABOT
WEEKDAY	325.0	1	5:24 PM	Fellsway
WEEKDAY	352.0	0	6:20 PM	Charlestown
WEEKDAY	426.0	1	7:35 AM	Lynn
WEEKDAY	426.0	0	8:50 AM	Lynn
WEEKDAY	426.0	0	11:30 AM	Lynn
WEEKDAY	450.0	0	3:40 PM	Lynn
WEEKDAY	468.4	0	8:00 AM	Lynn
WEEKDAY	701.0	1	8:45 AM	ALBANY
WEEKDAY	701.0	1	4:00 PM	ALBANY
WEEKDAY	701.0	1	5:30 PM	ALBANY
WEEKDAY	708.0	0	1:15 PM	ALBANY
WEEKDAY	747.0	1	10:50 AM	ALBANY
WEEKDAY	747.0	1	11:10 AM	ALBANY
WEEKDAY	747.0	1	12:30 PM	ALBANY
WEEKDAY	747.0	0	9:00 AM	ALBANY

**Table A-3.2**  
**Weekend Sample List and Schedule**  
**for Bus and Trackless Trolley**

Day	Route	Direction	Time	Garage
Saturday	1.0	0	6:10 AM	Cabot
Saturday	1.0	0	12:12 PM	Cabot
Saturday	17.0	0	11:50 AM	Cabot
Saturday	23.0	1	8:20 PM	Cabot
Saturday	23.0	0	12:50 PM	Cabot
Saturday	31.0	0	11:19 AM	Bartlett
Saturday	39.3	1	8:14 PM	Bartlett
Saturday	42.0	1	5:50 PM	Bartlett
Saturday	42.0	0	5:14 PM	Bartlett
Saturday	43.0	0	11:01 PM	Cabot
Saturday	46.0	0	3:15 PM	Bartlett
Saturday	47.0	1	7:30 PM	Cabot
Saturday	57.0	1	9:35 AM	Cabot
Saturday	62.4	0	5:00 PM	Som/Charlestown
Saturday	66.6	0	4:00 PM	Cabot
Saturday	77.0	1	6:40 PM	Som/Charlestown
Saturday	77.0	0	9:42 AM	Som/Charlestown
Saturday	78.1	1	6:40 PM	Som/Charlestown
Saturday	88.0	1	9:40 PM	Som/Charlestown
Saturday	130.0	1	3:45 PM	Charlestown
Saturday	400.0	1	9:05 PM	Lynn
Saturday	435.2	0	10:30 AM	Lynn
Saturday	450.0	0	11:30 AM	Lynn
Saturday	450.0	0	12:20 PM	Lynn
Saturday	455.0	0	8:30 AM	Lynn
Sunday	9.0	0	11:00 AM	Cabot
Sunday	16.3	0	9:20 AM	Cabot
Sunday	16.3	0	8:40 PM	Cabot
Sunday	28.0	1	2:10 PM	Bartlett
Sunday	28.0	0	2:40 PM	Bartlett
Sunday	39.3	1	9:20 PM	Bartlett
Sunday	72.1	1	7:10 PM	Som/Charlestown
Sunday	72.1	0	1:25 PM	Som/Charlestown
Sunday	88.0	1	6:12 PM	Som/Charlestown
Sunday	100.3	0	6:33 AM	Charlestown
Sunday	101.0	1	5:50 AM	Charlestown
Sunday	134.7	0	7:05 AM	Charlestown
Sunday	238.8	1	12:30 PM	Quincy

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## Appendix B: Sample Records and Statistical Calculations

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This appendix contains listings of the individual station and trip records that were used to determine fare category proportions as well as average fares, and the spreadsheets with the statistical calculations. For rapid transit and the subway Green Line, each record represents a specific location that was sampled for a specific time period. For surface Green Line and bus/trackless trolley, each record represents one sampled vehicle trip. The tables are as follows:

Table B-1.1	Station Sample Records for Heavy Rail and Subway Green Line (2 pages)
Table B-1.2	Statistical Calculations for Rapid Transit, Subway Green Line and the Heavy Rail System (3 pages)
Table B-2.1	Trip Sample Records: Weekday Surface Green Line - B Inbound (2 pages)
Table B-2.2	Trip Sample Records: Weekend Surface Green Line - B Inbound
Table B-2.3	Trip Sample Records: Weekday Surface Green Line - B Outbound (3 pages)
Table B-2.4	Trip Sample Records: Weekend Surface Green Line - B Outbound
Table B-3.1	Trip Sample Records: Weekday Surface Green Line - C Inbound (2 pages)
Table B-3.2	Trip Sample Records: Weekend Surface Green Line - C Inbound
Table B-3.3	Trip Sample Records: Weekday Surface Green Line - C Outbound (4 pages)
Table B-3.4	Trip Sample Records: Weekend Surface Green Line - C Outbound
Table B-4.1	Trip Sample Records: Weekday Surface Green Line - D Inbound (2 pages)
Table B-4.2	Trip Sample Records: Weekend Surface Green Line - D Inbound

Table B-4.3	Trip Sample Records: Weekday Surface Green Line - D Outbound (3 pages)
Table B-4.4	Trip Sample Records: Weekend Surface Green Line - D Outbound
Table B-5.1	Trip Sample Records: Weekday Surface Green Line - E Inbound (2 pages)
Table B-5.2	Trip Sample Records: Weekend Surface Green Line - E Inbound
Table B-5.3	Trip Sample Records: Weekday Surface Green Line - E Outbound (3 pages)
Table B-5.4	Trip Sample Records: Weekend Surface Green Line - E Outbound
Table B-6	Statistical Calculations for Surface Green Line and the Light Rail System
Table B-7	Trip Sample Records and Statistical Calculations: Bus and Trackless Trolley (4 pages)
Table B-8	Statistical Calculations of Weekly Passenger Boardings, True Average Fare and Average Pass Ride Value by Mode

Table B-1.1  
Station Sample Records for Heavy Rail and Subway Green Line

No.	GL	Station	Date	Day	Sch/Beg.	Turnstile		PAX	Rev.	Collector's Turnstile					Total					
						Token	Pass			Ad. Cash	Ad. Pass	Red.	SL 1/2	SL Pass	A. Free	N. Free	PAX	Used FB	All FB	
100	1	COPL	6/30/96	1	14:00	272	489	761	231.2	0	30	16	5	0	20	71	3.70	832	234.90	
39	1	GOVT	6/9/96	1	14:30	760	179	939	646	0	0	22	27	0	84	0	133	13.50	659.50	
102	1	KENM	6/30/96	1	13:00	70	300	370	59.5	0	19	11	8	0	11	0	49	5.00	64.50	
40	1	PARK	6/9/96	1	18:00	211	53	264	179.35	40	12	7	7	0	18	0	84	35.39	214.74	
4	1	INSTA	6/3/96	2	22:30	2367	349	2716	2011.95	0	0	0	0	0	0	0	0	0.00	2011.95	
6	1	PARK	6/3/96	2	23:00	102	42	144	86.7	3	2	0	1	0	6	0	12	2.73	89.43	
5	1	PARK	6/3/96	2	17:30	548	303	851	465.8	0	2	1	1	1	36	2	43	0.56	466.36	
8	1	BOYL	6/4/96	3	19:30	46	69	115	39.1	1	0	6	0	0	23	0	30	1.90	41.00	
9	1	COPL	6/4/96	3	14:00	364	168	532	309.4	0	2	36	9	35	10	94	10.00	319.40		
66	1	COPL	6/18/96	3	14:00	781	401	1182	663.85	0	59	35	44	27	0	165	22.79	1347		
10	1	HAYM	6/4/96	3	16:30	813	422	1235	116.45	0	0	12	0	0	2	0	14	2.22	686.64	
11	1	HAYM	6/4/96	3	16:30	232	383	615	197.2	0	1	21	3	7	16	0	48	5.30	1283	
14	1	KENM	6/5/96	4	14:30	5084	2765	7849	4321.40	0	2	33	10	15	13	0	73	9.82	688	
16	1	PARK	6/5/96	4	16:00	5084	2765	7849	4321.40	0	138	97	9	0	54	5	475	69.48	8324	
22	1	GOVT	6/6/96	5	19:30	855	372	1227	726.75	0	0	21	7	2	42	0	65	3.89	190.37	
79	1	GOVT	6/20/96	5	9:30	224	413	637	190.4	0	11	29	12	10	10	0	49	7.97	1571.70	
80	1	INSTA	6/20/96	5	6:30	1834	1964	3798	1558.9	0	42	57	11	5	27	0	137	23.30	3369.75	
25	1	GOVT	6/7/96	6	14:30	3937	933	1611	3346.45	0	0	94	11	5	27	0	137	23.30	4658	
30	1	ARLN	6/8/96	7	10:00	206	128	394	175.1	0	11	26	19	0	8	3	47	6.80	338	
96	1	GOVT	6/29/96	7	19:30	266	215	961	634.1	0	6	20	18	0	4	0	48	12.00	646.10	
33	1	HAYM	6/8/96	7	16:30	746	215	961	634.1	0	7	9	1	0	6	0	23	2.10	528	
34	1	HAYM	6/8/96	7	20:30	269	236	505	228.65	5	90	31	5	0	7	0	138	11.53	767	
36	1	AIRP	6/9/96	1	16:30	351	156	183	132.6	0	5	8	7	0	5	0	25	4.08	314.25	
37	1	CENT	6/9/96	1	14:00	156	27	84	49.3	0	5	31	11	0	8	0	71	7.41	140.01	
38	1	DAVS	6/9/96	1	11:00	58	26	84	49.3	0	24	43	11	0	0	78	10.80	609		
101	1	DTXG	6/30/96	1	12:30	357	174	531	303.45	0	17	26	8	0	0	51	8.05	211		
103	1	MALD	6/30/96	1	9:30	72	94	147	45.05	0	20	31	8	0	18	0	77	8.71	224	
104	1	ORNT	6/30/96	1	8:00	53	94	147	45.05	0	21	22	4	0	27	0	76	7.65	234	
105	1	PORT	6/30/96	1	16:00	106	378	643	225.25	2	56	37	43	0	0	136	18.60	779		
106	1	RUGG	6/30/96	1	15:45	265	305	745	374	0	0	5	0	0	2	0	7	0.93	752	
107	1	STAT	6/30/96	1	18:30	440	305	745	374	0	4	3	4	0	3	16	2.04	149		
2	1	AIRP	6/3/96	2	21:00	84	49	133	71.4	0	4	3	4	0	3	16	2.04	149		
3	1	ANDR	6/3/96	2	21:00	84	49	133	71.4	0	4	3	4	0	3	16	2.04	149		
67	1	FLDS	6/18/96	2	6:30	1332	2740	4072	1132.2	0	10	66	55	135	10	276	32.61	978		
42	1	FORE	6/10/96	2	18:30	429	343	772	364.65	0	33	167	23	327	53	608	39.46	4680		
43	1	MALD	6/10/96	2	9:30	261	810	1071	221.85	0	11	59	16	2	10	102	18.30	874		
44	1	NEMC	6/10/96	2	15:30	426	1395	1821	362.1	0	10	38	29	36	28	141	19.80	1212		
45	1	STAT	6/10/96	2	16:00	256	473	729	217.6	0	31	81	30	8	7	163	28.30	1984		
7	1	ARLN	6/4/96	3	14:30	369	89	458	313.65	0	0	38	9	6	15	68	12.30	797		
62	1	ASHM	6/18/96	3	11:30	369	89	458	313.65	0	9	92	36	37	19	8	201	30.38	659	
63	1	BBAY	6/18/96	3	9:30	157	384	541	133.45	7	6	31	4	4	7	0	59	13.07	600	
64	1	CCOL	6/18/96	3	14:30	456	1000	1456	387.6	15	53	14	6	20	5	6	119	18.93	1575	
47	1	CENT	6/11/96	3	6:30	147	325	472	124.95	0	3	0	4	1	4	0	12	1.48	484	
65	1	DTXG	6/18/96	3	15:30	268	1993	2261	227.8	124	44	14	5	18	4	1	102.08	2118	992.03	
61	1	FLDS	6/11/96	3	15:30	268	1993	2261	227.8	0	11	50	5	5	1	82	11.12	2343	238.92	
68	1	FLDS	6/18/96	3	14:30	152	128	280	129.2	0	22	44	27	13	6	0	112	18.16	959	147.36
48	1	JACK	6/11/96	3	7:00	244	461	705	207.4	0	29	28	34	152	11	0	254	15.30	959	222.70
69	1	KEND	6/18/96	3	5:30	179	103	282	152.15	7	5	8	1	0	0	21	7.36	303	159.51	
70	1	MASS	6/18/96	3	7:00	220	434	654	187	4	16	21	16	9	6	2	74	13.83	728	200.83
49	1	RUGG	6/11/96	3	16:00	303	475	778	257.55	0	38	61	11	32	8	0	154	18.60	932	276.15
12	1	STAT	6/4/96	3	18:00	178	423	601	151.3	0	0	16	11	0	6	0	33	7.40	634	158.70
50	1	STON	6/11/96	3	9:00	405	128	232	88.4	0	5	32	3	4	3	0	47	5.85	279	94.25
51	1	SULL	6/11/96	3	9:00	405	128	232	88.4	0	5	32	3	4	3	0	47	5.85	279	94.25
50	1	STON	6/11/96	3	9:00	405	128	232	88.4	0	5	32	3	4	3	0	47	5.85	279	94.25
71	1	ALWF	6/19/96	4	6:30	636	373	1009	2402.1	48	4	50	7	17	17	1	101	15.01	699	359.26
52	1	ANDR	6/12/96	4	7:00	1847	1123	2970	540.6	0	0	126	85	313	47	0	165	52.25	4879	2454.35
72	1	ASHM	6/19/96	4	7:00	1847	1123	2970	1569.95	0	0	225	126	85	313	47	0	15.36	1305	555.98
72	1	ASHM	6/19/96	4	7:00	1847	1123	2970	1569.95	0	0	225	126	85	313	47	0	54.84	3766	1624.79

Table B-1.1 (cont.)  
Station Sample Records for Heavy Rail and Subway Green Line

No.	GL	Station	Date	Day	Sch/Bkg	Turnstile			Rev.	Collector's Turnstile					Total						
						Token	Pass	FAX		Ad. Cash	Ad. Pass	Red.	St. 1/2	SL Pass		A. Free	N. Free	Used FB	All PAX	All FB	
53		BEAC	6/12/96	4	12:30	54	17	71	45.9	3	0	0	3	0	0	4	0	10	2.92	81	48.82
73		CENT	6/19/96	4	16:30	681	389	1070	578.85	56	51	45	8	8	2	0	170	55.39	1240	634.24	
74		JKU	6/19/96	4	14:30	1096	550	1646	931.6	0	56	103	138	89	35	0	421	70.22	2067	1001.82	
15		MALD	6/5/96	4	21:00	31	76	107	26.35	0	0	14	3	0	0	0	91	3.71	124	30.06	
15		MALD	6/5/96	4	17:30	114	194	308	96.9	31	18	22	16	3	1	0	91	32.67	399	129.57	
55		NQCY	5/6/96	4	10:00	179	103	282	152.15	10	6	24	0	0	8	0	48	12.32	330	164.47	
55		ORNT	6/12/96	4	14:00	273	80	353	232.05	17	18	25	8	10	1	0	79	20.98	432	253.03	
75		PORT	6/19/96	4	20:30	22	15	37	37.4	4	1	1	0	1	0	0	7	6.48	44	43.88	
17		QADM	6/5/96	4	7:00	1724	1449	3173	1465.4	27	20	41	7	8	5	0	108	31.45	3281	1496.85	
56		WOND	6/12/96	4	15:30	751	775	1526	638.35	21	63	49	29	22	2	0	186	37.10	1712	675.45	
57		AQUA	6/13/96	5	12:30	88	102	190	74.8	0	12	40	3	1	0	0	56	6.15	246	80.95	
77		BOYL	6/20/96	5	9:30	220	54	274	374	55	25	34	12	8	10	0	144	102.90	418	476.90	
78		BRNT	6/20/96	5	11:00	335	151	486	284.75	0	4	30	7	51	14	0	106	8.15	592	292.90	
20		DTXG	6/6/96	5	15:30	1399	566	1965	1189.15	0	7	70	33	145	38	11	304	28.20	2269	1217.35	
21		DTXG	6/6/96	5	5:30	654	253	907	555.9	0	0	38	0	0	51	0	89	7.04	996	562.94	
23		HARV	6/6/96	5	22:30	1396	109	1705	1356.6	104	38	43	0	17	0	0	202	89.85	1907	1446.45	
26		MAVE	6/13/96	5	8:00	993	129	1122	844.05	92	34	26	12	5	1	0	170	81.70	1292	925.75	
26		MAVE	6/13/96	5	8:00	767	291	1058	1303.9	56	50	257	12	18	74	2	469	145.25	1527	1449.15	
81		QCTR	6/20/96	5	6:30	366	956	1322	311.1	12	123	65	47	45	5	0	297	38.91	1619	350.01	
81		WOLL	6/20/96	5	7:00	724	577	1301	615.4	2	2	22	9	4	6	0	43	8.99	1344	624.39	
24		BEAC	6/7/96	6	6:30	402	1104	1506	341.7	47	88	86	49	9	11	2	292	71.10	1798	412.80	
82		DAVS	6/21/96	6	6:30	1843	1505	3348	1566.55	2	43	106	10	10	20	0	146	24.92	3529	1591.47	
83		HARV	6/21/96	6	6:30	755	196	951	641.75	0	27	67	30	17	5	0	181	23.53	1097	665.28	
84		HARV	6/21/96	6	11:00	2131	1054	3185	1811.35	0	87	193	52	22	10	0	364	55.02	3549	1866.37	
85		HARV	6/21/96	6	9:00	156	304	460	132.6	0	17	43	12	1	0	0	73	9.05	533	141.65	
86		NQCY	6/21/96	6	9:00	111	279	390	94.35	37	7	57	26	2	4	0	133	49.33	523	143.68	
87		PORT	6/21/96	6	5:30	2380	1820	4200	4046	33	68	22	3	18	8	0	152	53.30	4352	4099.30	
59		QADM	6/14/96	6	14:00	244	184	428	414.8	0	0	17	5	23	5	0	232	138.81	660	553.61	
60		QCTR	6/14/96	6	17:00	101	71	172	85.85	0	0	17	5	1	2	0	25	5.80	197	91.65	
27		REVE	6/7/96	6	15:00	4271	2258	6529	3630.35	0	74	170	11	14	60	0	329	35.57	6858	3665.92	
88		STAT	6/21/96	6	14:00	1234	2026	3260	1048.9	0	5	53	22	7	0	13	3	81	12.41	3341	1061.31
28		STAT	6/7/96	6	17:00	906	266	772	430.1	0	0	22	26	0	8	0	56	13.71	828	443.81	
29		AQUA	6/8/96	7	17:00	338	109	447	287.3	0	9	76	30	6	8	18	147	25.20	594	312.50	
89		ASHIM	6/22/96	7	14:30	366	492	858	311.1	141	112	52	20	0	34	0	359	132.56	1217	443.66	
31		BBAY	6/8/96	7	13:00	60	61	121	51	0	12	26	3	0	3	0	44	5.56	165	56.56	
94		BOYL	6/29/96	7	8:00	278	133	411	236.3	2	2	105	9	9	0	8	0	126	24.36	537	260.66
90		CENT	6/22/96	7	12:30	293	275	568	249.05	0	7	33	7	7	0	1	0	48	7.40	616	256.45
91		CHAS	6/22/96	7	15:30	1010	294	1304	858.5	0	41	58	52	0	0	0	151	30.01	1455	888.51	
92		DTXG	6/22/96	7	11:00	294	174	468	249.9	2	9	87	6	6	0	5	0	109	22.71	577	272.61
95		DTXG	6/29/96	7	22:15	692	251	943	249.9	0	26	27	7	7	0	22	14	96	7.60	1039	595.80
32		HARV	6/8/96	7	21:00	103	57	160	87.55	0	6	11	6	0	6	0	29	4.26	189	91.81	
35		MALD	6/8/96	7	7:00	57	80	137	48.45	0	10	10	2	0	1	0	23	2.59	160	51.04	
97		MASS	6/29/96	7	5:30	97	213	310	82.45	0	0	11	0	0	2	0	13	2.04	323	84.49	
98		MAVE	6/29/96	7	14:00	124	220	344	105.4	0	0	3	24	8	0	5	0	40	7.60	384	113.00
99		STAT	6/22/96	7	8:00	335	145	480	284.75	4	18	46	8	8	0	4	0	80	14.64	560	299.39

Table B-1.2  
Statistical Calculations for Rapid Transit, Subway Green Line and the Heavy Rail System

Turnstiles:				Collector's Turnstile:			
Weekday	subw. CL	Sum	17324	8385	Weekday	PAX	FB
	Rapid Transit		38640	34656		25709	14723.4
	subw. CL		3209	2359		73296	35932.05
	Rapid Transit		6240	4123		5568	2727.65
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.3262	0.6738	Weekday	PAX	FB
	Rapid Transit		0.4728	0.5272		10478	1996.7384
	subw. CL		0.4237	0.5763		2542	471.48386
	Rapid Transit		0.3979	0.6021		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
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	Rapid Transit		0.4069	0.5931		99005	50687.45
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Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
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Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
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Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
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Fare-Mix			Av. FB Dep.			Sum	
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	Rapid Transit		0.4069	0.5931		99005	50687.45
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Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
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	Rapid Transit		0.4069	0.5931		99005	50687.45
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Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
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Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
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	Rapid Transit		0.4069	0.5931		99005	50687.45
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Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL		0.4347	0.5653	Weekday	PAX	FB
	Rapid Transit		0.4069	0.5931		99005	50687.45
	subw. CL		0.4359	0.5641		15931	8031.65
	Rapid Transit		0.40436	0.5956		55964	43041
Fare-Mix			Av. FB Dep.			Sum	
Weekday	subw. CL						

Table B-1.2 (cont.)

27045	14898.154
82438	37756.034
6114	2819.9699
12359	5683.1639

<i>Weekday</i>	subv. GL	17328	8644	526	195	103	249
	Rapid Transit	39535	36279	2982	1012	1894	7446
<i>Weekend</i>	subv. GL	3249	2461	128	104	2	170
	Rapid Transit	6396	4652	813	282	6	210
Sum							

Precision	Az. FB Dcp.
14.97	0.5329
13.83	0.45836
17.06	0.5509
15.930	0.4580
30.952	0.4612
12.31	0.4598

Fura-Mix							
Week	subno. GL	0.6206	0.3349	0.0197	0.0090	0.0032	0.0126
	Rapid Transit	0.48452	0.4318	0.0400	0.0137	0.0139	0.0001
Weekday	subno. GL	0.6407	0.3196	0.019449	0.0072	0.0038	0.0092
	Rapid Transit	0.4796	0.4401	0.0362	0.0123	0.0029	0.0090
Weekend	subno. GL	0.53140	0.40252	0.0209	0.0170	0.0003	0.0278
	Rapid Transit	0.51752	0.37641	0.0658	0.0228	0.0049	0.0170

Ar. PAX	STDEV	COV	Ar. FB	STDEV	COV	Correl.
1507.23	1920.146	1.2740	805.37	1116.62	1.386	0.970
1199.96	1286.39	1.072	549.86	728.14	1.324	0.8868
1931.79	2303.10	1.192	1064.154	1336.33	1.256	0.970
1472.11	1427.19	0.969	674.21	825.39	1.224	0.876
764.250	467.71	0.612	357.50	236.12	0.670	0.812
537.348	356.77	0.6640	247.09	203.46	0.823	0.946

PAX	FB
127956	61157.32
109483	52654.188
18473	8503.1339

	Sum	1993	1995	1997
Week	66508	4449	1593	1375
Weekday	56863	44923	1207	995
Weekend	9645	7113	386	380

Precision	10.88	0.4780
Av.	12.53	0.4809
FB Dep.	12.03	0.4603

	Fare-Mix					
Week	0.5198	0.4067	0.0348	0.012450	0.0156	0.0107
Weekend	0.51938	0.4103	0.0320	0.0110	0.0181	0.0091
Weekend	0.5221	0.3850	0.0509	0.0209	0.00043	0.0206

	<i>Av. FAX</i>	<i>STDEV</i>	<i>COV</i>	<i>Av. FB</i>	<i>STDEV</i>	<i>COV</i>	<i>Correl.</i>
1	1266.89	1442.6516	1.139	605.518	828.62	1.3685	0.9187
2	1853.13	1630.11	0.880	752.20	950.88	1.264	0.941
3	595.90	393.16	0.660	274.29	213.45	0.778	0.906

10.550	0.43772
11.91	0.48140
11.97	0.46020

12.42	0.46344
14.142	0.4643
11.0351	0.45999

	Week	Weekday	Weekend
<b>weight:</b>	0.5188	0.40736	0.0249
	0.5202	0.4097	0.0320
	0.5210	-0.3930	0.05448
			0.02155
			0.01248
			0.0157
			0.0107

	Week	Weekday	Weekend
<b>HR System:</b>	0.4938	0.4252	0.0386
	0.4906	0.4319	0.0350
	0.51946	0.3782	0.0627
			0.02242
			0.00947
			0.01777
			0.0091
			0.01979
			0.01033
			0.0188
			0.0216

GL	COV <sub>max</sub>	COV <sub>reg</sub>	COV <sub>cor</sub>	KE	COV <sub>max</sub>	COV <sub>reg</sub>	COV <sub>cor</sub>
0.00052196	0.000817623	-0.0012674	0.012213	0.018110	-0.0263667		
0.000778181	0.001205807	-0.0018797	0.013974	0.021511	-0.0303836		
0.000415401	0.000550407	-0.0007408	0.015726	0.024170	-0.0369004		
0.000652598	0.009543228	-0.0153100	0.007181	0.009950	-0.0419921		
0.009546232	0.013580558	-0.0220943	0.008069	0.011404	-0.0168106		
0.00491502	0.005912586	-0.0087596	0.0068758	0.013442	-0.0205369		



**Trip Sample Records: Weekday Surface Green Line - B Inbound**

[illegible]

Table B-2.1 (cont.)  
Trip Sample Records: Weekday Surface Green Line - B Inbound

Rec. No.	Prbl. No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Reg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. JZ	St. Pass	A. Free	N. Free	Inb.	Outb.	FAX	Fare Box	FB Est.	FB OK2	Used FB	Cor.	Calc. of Fare	Av. FB	n
30039	B	812	1	DONOHUE	DOOLAN	3	5/21/96	14:04	3600A	2	256311	256424	0	8	13	3	1	9			30	34	9.13	7.8	NO	2.80	265.20	45.46	0.629	1
30021	B	812	1	BARRETT	SASSO	2	5/13/96	14:05	342A	1	128072	128448	5	51	27	11	2	6	2		70	99	45.46	46.35	YES	46.35	458.65	46.35	0.629	2
30040	B	812	1	BARRETT	SASSO	3	5/21/96	14:20	3671A	2	144854	145919	1	15	17	2	0	4			33	36	11.65	13.15	YES	13.15	499.70	11.65	0.346	3
30036	B	812	1	ANDON	DEMPSEY	2	5/21/96	14:27	3668A	2	1385435	1397509	0	31	28	0	0	3	1		47	63	20.74	26.35	YES	26.35	1660.05	20.74	0.418	4
30019	B	812	1	DONOHUE	DOOLAN	3	4/23/96	14:36	3668B	1	2259402	2269927	3	42	27	1	0	4	3		35	60	18.25	21.45	YES	21.45	1287.00	18.25	0.358	5
30059	B	812	1	DONOHUE	ANDON	2	5/13/96	14:44	3621A	2	2670318	2670224	0	25	27	1	0	2			68	81	33.06	36.9	YES	36.90	2988.90	33.06	0.456	6
30062	B	812	1	BARRETT	SASSO	2	5/19/96	14:52	3631A	2	2678137	2679032	0	25	13	2	0	1			48	41	15.15	21.65	YES	21.65	897.45	15.15	0.528	7
30023	B	812	1	DONOHUE	DOOLAN	4	5/19/96	14:55	3648A	2	3312246	3315122	0	39	29	3	0	1	1		45	53	28.76	33.75	YES	33.75	1788.75	28.76	0.637	8
30051	B	812	1	ANDON	DEMPSEY	2	5/20/96	15:05	3660B	2	1748302	1749846	1	21	27	1	4	1			62	54	16.44	19.65	YES	19.65	1061.10	16.44	0.344	9
30022	B	812	1	DONOHUE	DOOLAN	4	5/13/96	15:32	3695B	2	2203872	2205597	0	30	22	4	0	1			51	57	17.25	26.3	YES	26.30	1499.10	17.25	0.461	10
30022	B	812	1	ANDON	DEMPSEY	2	5/14/96	15:40	3470A	2	1782878	1786218	2	48	31	2	0	2	1		75	84	35.4	41.2	YES	41.20	3460.80	35.4	0.490	11
30043	B	812	1	BARRETT	SASSO	2	5/14/96	15:42	3470A	2	1782878	1786218	2	48	31	2	0	2	1		75	84	35.4	41.2	YES	41.20	3460.80	35.4	0.490	11
Sum													335	245	35	7	34	8	0	Mean	60.4	60.4				26.78	0.444	0.432	11	
%													0.505	0.369	0.053	0.011	0.051	0.012	0.000	STDEV	20.4	20.4				11.906	0.13	0.12	11	
664																														
													Tolerance																	
30042	B	812	1	ANDON	DEMPSEY	2	5/21/96	16:37	3517B	2	2071449	2073808	0	35	33	1	0	2	1		52	69	24.59	29.95	YES	29.95	2064.55	24.59	0.434	1
30036	B	812	1	DONOHUE	ANDON	3	5/28/96	17:10	3423A	2	1733633	1734463	0	14	19	0	0	2			32	36	8.3	11.9	YES	11.90	428.40	8.3	0.331	2
30034	B	812	1	DONOHUE	SASSO	3	5/28/96	17:15	3489A	2	1600285	1601075	0	11	34	1	0	2			43	48	7.9	9.55	YES	9.55	458.40	7.9	0.199	3
30024	B	812	1	ANDON	DEMPSEY	2	5/20/96	17:40	3688A	2	2427447	2424562	1	12	14	0	1				22	27	9.15	10.6	YES	10.60	286.20	9.15	0.393	4
30032	B	812	1	SASSO	BARRETT	3	5/7/96	18:00	3606	2	2580703	2580973	1	3	10	2	0	3	1		15	19	3.7	2.95	NO	2.95	56.05	3.7	0.155	5
Sum													75	110	4	1	7	2	0	Mean	39.8	39.8				12.99	0.326	0.302	5	
%													0.377	0.553	0.020	0.005	0.035	0.010	0.000	STDEV	19.6	19.6				10.069	0.177	0.121	5	
199																														
30035	B	812	1	BARRETT	DOOLAN	3	5/28/96	18:39	3687B	1	3073866	3076046	0	25	29	33	0				45	87	21.6	27.85	YES	27.85	2422.95	21.6	0.320	1
30060	B	812	1	DONOHUE	ANDON	4	5/8/96	19:10	3445A	2	2334447	2335942	0	14	32	0	0	2			37	46	5.95	11.9	YES	11.90	547.40	5.95	0.259	2
30028	B	812	1	SASSO	DOOLAN	2	4/22/96	19:20	3695A	1	853112	858552	0	47	48	7	0				85	104	53.4	41.35	NO	41.35	4300.40	53.4	0.398	3
30038	B	812	1	BARRETT	SASSO	2	5/8/96	19:20	3621A	2	2872264	2873419	0	19	6	2	0				23	27	11.55	16.55	YES	16.55	446.85	11.55	0.613	4
30030	B	812	1	DONOHUE	ANDON	2	5/16/96	20:19	3601A	1	1449339	1451875	0	31	18	2	0				34	51	22.36	26.75	YES	26.75	1364.25	22.36	0.525	5
30027	B	812	1	DONOHUE	ANDON	2	4/22/96	20:50	3495A	2	2161095	2162419	2	16	17	0	0				26	35	10.5	13.6	YES	13.60	476.00	10.5	0.389	6
30026	B	812	1	BARRETT	ANDON	2	5/16/96	21:00	3688B	2	3720668	3721426	0	14	8	0	0				24	22	7.6	11.90	YES	11.90	261.80	7.6	0.541	7
30033	B	812	1	DONOHUE	ANDON	3	5/7/96	22:16	3431A	1	2707835	2708786	0	35	17	1	0				46	53	11.51	29.95	NO	29.95	1587.35	11.51	0.565	8
30035	B	812	1	DOOLAN	DOOLAN	3	5/7/96	22:16	3431A	1	2580551	2586071	1	40	25	1	0	2			37	68	11.2	34.2	NO	34.20	2325.60	11.2	0.549	9
30031	B	812	1	SASSO	DOOLAN	2	5/16/96	22:32	3691B	1	3320369	3322084	0	26	13	2	0				16	34	17.15	22.5	YES	22.50	922.50	17.15	0.436	10
30029	B	812	1	DONOHUE	ANDON	2	4/22/96	23:31	3698A	1	3161767	3162872	0	19	18	0	0				34	37	11.05	16.15	YES	16.15	597.55	11.05	0.463	11
Sum													286	231	48	0	2	4	0	Mean	51.9	51.9				22.97	0.443	0.443	11	
%													0.501	0.405	0.084	0.000	0.004	0.007	0.000	STDEV	25.3	25.3				9.857	0.16	0.112	11	
571																														
																					Tolerance	30.8								

Table B-2.2

0.29
13.4

**Table B-2.3**  
**Trip Sample Records: Weekday Surface Green Line - B Outbound**

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n
30467	B	812	0	DONOHUE	ANDON	6	5/31/96	5:36	3639B	1									5			5	1
30441	B	812	0	BARRETT	DOOLAN	4	4/24/96	5:50	3663A	1									14			18	2
30469	B	812	0	SASSO	ANDON	6	4/19/96	5:56	3685A	1									13			23	3
																					Sum		
																					Mean		
																					STDEV		
																					COV		
																					Tolerance		
																					58.7 %		

30454	B	812	0	DOOLAN	ANDON	5	5/9/96	6:04	3688B	1									11			15	1
30459	B	812	0	BARRETT	DOOLAN	6	4/19/96	6:26	3651B	1									18			25	2
30456	B	812	0	DEMPSEY	DONOHUE	5	5/9/96	6:37	3646B	1									35			57	3
30457	B	812	0	DOOLAN	BARRETT	5	5/16/96	7:00	3604B	2									10			48	4
30461	B	812	0	DEMPSEY	DONOHUE	6	5/10/96	7:12	3612A	1									0			16	5
30464	B	812	0	SASSO	ANDON	6	5/10/96	7:22	3602B	2									21			37	6
30452	B	812	0	ANDON	DONOHUE	5	5/30/96	7:58	3535B	1									50			42	7
30468	B	812	0	ANDON	DONOHUE	6	5/31/96	7:58	3500A	2									7			40	8
30444	B	812	0	DEMPSEY	BARRETT	4	5/29/96	8:10	3619A	2									11			23	9
30466	B	812	0	DEMPSEY	BARRETT	6	5/31/96	8:12	3543A	2									8			26	10
30448	B	812	0	DEMPSEY	BARRETT	5	5/30/96	8:16	3448B	1									24			48	11
30443	B	812	0	ANDON	DONOHUE	4	5/29/96	8:17	3472B	1									33			52	12
30462	B	812	0	DEMPSEY	DONOHUE	6	5/10/96	8:35	3678A	1									22			65	13
30447	B	812	0	BARRETT	ANDON	4	5/22/96	8:47	3660B	1									12			17	14
																					Sum		
																					Mean		
																					STDEV		
																					COV		
																					Tolerance		
																					42.1 %		

**Table B-2.3 (cont.)**  
**Trip Sample Records: Weekday Surface Green Line - B Outbound**

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	St. 1/2	St. Pass	A_free	N_free	Inb.	Outb.	n
30453	B	812	0	ANDON	DEMPSEY	5	5/16/96	9:38	3695A	2								10			10	1
30463	B	812	0	BARRETT	DOOLAN	6	5/10/96	9:48	3412A	1								26			45	2
30442	B	812	0	DEMPSEY	ANDON	4	4/24/96	9:52	3644B	1								1			10	3
30435	B	812	0	DONOHUE	DOOLAN	4	5/15/96	10:04	3501	2								8			17	4
30434	B	812	0	DEMPSEY	ANDON	4	5/15/96	10:07	3499B	1								2			3	5
30451	B	812	0	DONOHUE	DEMPSEY	5	5/9/96	10:08	3621A	1								34			32	6
30436	B	812	0	BARRETT	SASSO	4	5/15/96	10:09	3620B	1								42			6	7
30460	B	812	0	DEMPSEY	DONOHUE	6	4/19/96	10:31	3543A	1								17			21	8
30458	B	812	0	SASSO	ANDON	6	4/19/96	10:54	3651B	1								61			51	9
30445	B	812	0	DEMPSEY	BARRETT	4	5/29/96	10:56	3543B	1								27			38	10
30465	B	812	0	SASSO	ANDON	6	5/10/96	11:20	3653B	1								54			40	11
30446	B	812	0	BARRETT	ANDON	4	5/22/96	11:24	3470A	1								24			16	12
30449	B	812	0	DEMPSEY	BARRETT	5	5/30/96	11:33	3421B	1								25			28	13
30408	B	812	0	DEMPSEY	ANDON	2	5/20/96	12:45	3633A	1								13			17	14
30422	B	812	0	BARRETT	SASSO	3	4/23/96	13:05	3605B	1								36			17	15
30427	B	812	0	DONOHUE	DOOLAN	3	5/21/96	13:05	3683A	2								18			14	16
30405	B	812	0	BARRETT	SASSO	2	5/20/96	13:07	3641A	1								31			40	17
30426	B	812	0	DONOHUE	DEMPSEY	3	5/14/96	13:07	3660A	1								23			7	18
30433	B	812	0	ANDON	DEMPSEY	3	5/21/96	13:11	3437B	1								36			59	19
30410	B	812	0	BARRETT	SASSO	2	5/13/96	13:15	3601A	1								44			42	20
30450	B	812	0	BARRETT	DONOHUE	5	4/25/96	13:20	3624B	2								29			27	21
30421	B	812	0	ANDON	DEMPSEY	3	4/23/96	13:33	3651B	1								68			51	22
30429	B	812	0	BARRETT	SASSO	3	5/21/96	13:36	3517B	2								39			57	23
30409	B	812	0	DOOLAN	DONOHUE	2	5/13/96	13:53	3653B	2								29			62	24
30440	B	812	0	DEMPSEY	ANDON	4	5/8/96	13:53	3606A	1								73			60	25
30406	B	812	0	DONOHUE	DOOLAN	2	5/20/96	13:59	3470A	1								41			23	26
																				Sum	811	
																				Mean	31.2	
																				STDEV	18.6	
																				COV	0.60	
																				Tolerance	25.8 %	

Table B-2.3 (cont.)

Imp sample record

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A free	N free	Inb.	Outb.	n	
30455	B	812	0	BARRETT	SASSO	5	5/9/96	14:09	3629A	2									45				43	1
30439	B	812	0	DONOHUE	DOOLAN	4	5/8/96	14:30	3676A	2									31				20	2
30412	B	812	0	ANDON	DEMPSEY	2	5/13/96	14:42	3600B	1									43				61	3
30430	B	812	0	BARRETT	SASSO	3	5/14/96	14:47	3412A	2									29				51	4
30431	B	812	0	ANDON	DEMPSEY	3	5/21/96	15:46	3489B	2									20				44	5
30418	B	812	0	DONOHUE		3	5/28/96	15:54	3660B	2									10				10	6
																					Sum		178	

Sum	178
Mean	29.7
STDEV	13.4
COV	0.45
Tolerance	40.5 %

[illegible]

Sum	369
Mean	61.5
STDEV	14.7
COV	0.24
Tolerance	21.5 %

[illegible]

Sum	427
Mean	42.7
STDEV	20.6
COV	0.48
Tolerance	33.6 %

Table B-2.4  
Trip Sample Records: Weekend Surface Green Line - B Outbound

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n																				
30392	B	812	0	BARRETT	ANDON	1	4/21/96	18:47	3489B	1									32				45	1																			
30394	B	812	0	BARRETT	ANDON	1	4/21/96	21:50	3661B	1									56				142	2																			
30395	B	812	0	DONOHUE	DEMPSEY	1	4/21/96	13:33	3698A	1									62				57	3																			
30396	B	812	0	DEMPSEY	DONOHUE	1	4/21/96	16:42	3695A	1									72				97	4																			
30397	B	812	0	DONOHUE	DEMPSEY	1	4/21/96	14:56	3683A	1									3				42	5																			
30398	B	812	0	DONOHUE	SASSO	1	4/28/96	15:24	3696A	1									54				56	6																			
30399	B	812	0	SASSO	DONOHUE	1	4/28/96	13:17	3622B	1									2				8	7																			
30400	B	812	0	ANDON	DEMPSEY	1	4/28/96	16:10	3630B	1									8				37	8																			
30401	B	812	0	ANDON	DEMPSEY	1	4/28/96	13:31	3673B	1									68				31	9																			
30402	B	812	0	BARRETT	DOOLAN	1	4/28/96	18:51	3658	1									41				52	10																			
30403	B	812	0	DOOLAN	DONOHUE	1	5/12/96	13:47	3688	1									11				38	11																			
30404	B	812	0	ANDON	DEMPSEY	1	5/19/96	14:18	3649B	1									7				42	12																			
30470	B	812	0	SASSO	ANDON	1	4/20/96	22:58	3698A	1									102				71	13																			
30471	B	812	0	DEMPSEY	DONOHUE	1	4/20/96	8:25	3663	1									3				8	14																			
30472	B	812	0	DEMPSEY	DOOLAN	1	5/11/96	7:30	3646B	1									4				10	15																			
30473	B	812	0	ANDON	DONOHUE	1	5/11/96	6:33	3631A	1									6				17	16																			
30474	B	812	0	SASSO	BARRETT	1	5/11/96	10:40	3601A	1									43				33	17																			
30475	B	812	0	BARRETT	SASSO	1	5/18/96	21:14	3661A	1									39				75	18																			
30476	B	812	0	DONOHUE	DOOLAN	1	5/18/96	12:13	3413A	1									119				111	19																			
30477	B	812	0	DONOHUE	DOOLAN	1	5/18/96	11:00	3695A	1									37				90	20																			
30478	B	812	0	SASSO	ANDON	2	4/20/96	17:30	3683A	2									46				78	21																			
																					Sum	815																					
																					Mean	38.8																					
																					STDEV	33.5																					
																					COV	0.86																					
																					Tolerance	41.5 %																					

### Table B-3.1

Acc No	Prob	Ref	Net	Dir	Obs	Rec	Day	Date	Time	Vch	Ctr	Reg	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 172	St. Past	A. free	N. free	Inb	Outb	PAY	Face Box	FB Est.	FB OK?	Used FB	Cor.	Calc. of Free Evation	Av. FB	n
30148	C	R31	1	DEMSEY	DONOHUE	0	4	5/22/96	5:01	3650A	1	259680	2597073	0	2	7	3	0	0	0	0	17	12	12	1.95	2.3	0.192	1	1.95	2.3	0.192	1
30181	C	R31	1	DOOLAN	BARRETT	0	6	5/10/96	5:30	3649A	1	259148	2594453	0	3	13	1	0	0	0	0	16	17	17	2.75	2.75	0.177	2	2.75	2.75	0.177	2
						Sum									5	20	4	0	0	0	0	Mean	14.5				2.53	0.174				
						Sum									0.172	0.690	0.138	0.000	0.000	0.000	0.000	STDEV	3.5				0.318	1.125				
						Sum																COV	0.24				0.13	0.21				
						29																Tolerance	36.2				18.7	1.00				
30001	C	R31	1	ANDON	DOOLAN	0	1	5/9/96	8:05	3542B	1	201420A	2016644	0	30	110	5	0	10	0	0	150	153	153	24.4	26.5	0.171	1	24.4	26.5	0.171	1
30083	C	R31	1	DEMSEY	DONOHUE	0	1	6/4/96	6:01	3655A	1	109010A	1095669	0	9	20	0	0	0	0	0	27	29	29	4.65	7.65	0.264	2	4.65	7.65	0.264	2
30097	C	R31	1	DEMSEY	DONOHUE	0	6	5/10/96	6:01	3648A	1	304481A	304481	1	9	10	1	0	0	0	0	15	15	15	1.95	1.95	0.106	4	1.95	1.95	0.106	4
30106	C	R31	1	DEMSEY	BARRETT	0	2	5/30/96	6:30	3660A	1	271857	271852	0	2	14	0	0	0	0	0	32	32	32	3.3	3.3	0.255	5	3.3	3.3	0.255	5
30109	C	R31	1	DOOLAN	BARRETT	0	11	5/16/96	6:30	3648B	1	386161B	3861948	0	11	24	0	0	0	0	0	35	35	35	3.6	6.15	0.181	6	3.6	6.15	0.181	6
30149	C	R31	1	DONOHUE	DEMSEY	0	7	5/16/96	6:37	3611B	1	1368829	1369189	0	7	23	1	0	3	0	0	25	25	25	3.6	6.15	0.181	7	3.6	6.15	0.181	7
30161	C	R31	1	SASSO	DONOHUE	0	1	5/16/96	6:37	3647A	1	195407	195407	0	6	31	2	0	0	0	0	26	26	26	3.8	4.45	0.165	8	3.8	4.45	0.165	8
30173	C	R31	1	DEMSEY	DONOHUE	0	2	6/10/96	6:46	3696A	1	967606	967606	0	2	5	0	0	0	0	0	35	35	35	7.45	10.15	0.226	9	7.45	10.15	0.226	9
30178	C	R31	1	ANDON	SASSO	0	11	5/10/96	6:50	3649B	1	398820	3988955	0	11	30	4	0	0	0	0	45	45	45	5.1	8.45	0.217	10	5.1	8.45	0.217	10
30178	C	R31	1	ANDON	SASSO	0	1	6/19/96	6:50	3691A	1	241939	2419649	0	1	35	3	0	0	0	0	35	35	35	5.1	8.45	0.217	11	5.1	8.45	0.217	11
30178	C	R31	1	DEMSEY	DONOHUE	0	2	6/19/96	7:21	3646B	1	216802	2169052	0	2	56	1	0	0	0	0	63	63	63	19.25	27.4	0.230	12	19.25	27.4	0.230	12
30178	C	R31	1	DEMSEY	DONOHUE	0	2	5/19/96	7:21	3646B	1	21780	22705	0	2	103	2	0	0	0	0	115	119	119	19.25	27.4	0.230	13	19.25	27.4	0.230	13
30162	C	R31	1	DONOHUE	ANDON	0	2	5/29/96	7:42	3681B	1	310836	3108606	0	32	103	2	0	0	0	0	125	125	125	17.24	26.7	0.195	14	17.24	26.7	0.195	14
30160	C	R31	1	DONOHUE	ANDON	0	4	4/24/96	7:53	3608A	1	273963	2739639	0	30	100	6	0	0	0	0	150	150	150	19.75	29.1	0.205	15	19.75	29.1	0.205	15
20157	C	R31	1	DEMSEY	ANDON	0	2	4/24/96	8:08	3692A	1	3904491	3904466	0	34	107	1	0	0	0	0	56	56	56	14.95	16.3	0.253	16	14.95	16.3	0.253	16
30156	C	R31	1	SASSO	ANDON	0	1	6/4/96	8:45	3653B	1	109569	111064	0	18	40	3	4	0	0	0	70	70	70	0.029	0.04	0.004	17	0.029	0.04	0.004	17
30178	C	R31	1	SASSO	ANDON	0	1	6/4/96	8:45	3653B	1	109569	111064	0	18	40	3	4	0	0	0	70	70	70	0.029	0.04	0.004	18	0.029	0.04	0.004	18
						Sum									259	800	33	4	20	0	0	Mean	50.2				3.812	479.283				
						%									0.231	0.714	0.029	0.004	0.004	0.018	0.000	STDEV	0.72				0.69	0.18				
						1120																COV	37.6				36.1	0.97				
30002	C	R31	1	DONOHUE	DOOLAN	0	1	2/5/20/96	12:12	3678	1	3787301	3788106	0	13	9	4	0	0	0	0	81	81	81	7.85	8.5	0.386	1	7.85	8.5	0.386	1
30168	C	R31	1	DEMSEY	ANDON	0	2	5/16/96	9:12	3631B	1	2111399	2112184	0	10	12	0	0	0	0	0	15	15	15	8.50	147.00		2	8.50	147.00		2
30164	C	R31	1	DONOHUE	DEMSEY	0	5	5/9/96	9:34	3542B	1	2016644	2021019	0	59	66	14	0	0	0	0	140	140	140	43.75	52.95	0.378	2	43.75	52.95	0.378	2
30174	C	R31	1	DEMSEY	DONOHUE	0	6	4/19/96	9:54	3640B	1	2695172	2612992	0	33	32	9	2	0	0	0	73	76	76	78.2	306.6	0.403	3	78.2	306.6	0.403	3
30562	C	R31	1	DEMSEY	BARRETT	0	20	6/29/96	10:28	3630A	1	2078281	2088356	0	31	26	9	0	0	0	0	64	64	64	100.75	277.5	0.434	4	100.75	277.5	0.434	4
30171	C	R31	1	DEMSEY	BARRETT	0	4	5/29/96	10:30	3650A	1	2494194	2496228	0	28	20	4	0	0	0	0	57	57	57	27.60	178.80	0.438	5	27.60	178.80	0.438	5
30171	C	R31	1	DEMSEY	BARRETT	0	5	5/32/96	10:30	3650A	1	2997435	2996036	0	49	40	27	0	0	0	0	116	116	116	32.21	47.05	0.429	6	32.21	47.05	0.429	6
30152	C	R31	1	DEMSEY	ANDON	0	6	5/31/96	10:31	3652A	1	3256735	3256892	0	19	15	5	0	0	0	0	32	32	32	13.1	17.15	0.401	7	13.1	17.15	0.401	7
30152	C	R31	1	DEMSEY	BARRETT	0	1	4/24/96	10:31	3691B	1	3230777	3232692	0	33	3	6	0	0	0	0	74	74	74	19.15	29.25	0.391	8	19.15	29.25	0.391	8
30158	C	R31	1	DONOHUE	SASSO	0	1	6/19/96	10:31	3648A	1	1937663	1939789	0	28	28	10	0	0	0	0	48	48	48	20.45	29.25	0.401	9	20.45	29.25	0.401	9
30172	C	R31	1	BARRETT	DOOLAN	0	2	6/19/96	10:54	3691A	1	1072634	1072799	0	15	3	1	0	0	0	0	6	6	6	1.65	1.9	0.317	10	1.65	1.9	0.317	10
30177	C	R31	1	SASSO	ANDON	0	3	5/10/96	11:00	3646A	1	237917	2374080	0	2	3	1	0	0	0	0	33	33	33	8.85	13.75	0.433	11	8.85	13.75	0.433	11
30163	C	R31	1	ANDON	DONOHUE	0	5	5/30/96	11:00	3646A	1	237917	2374080	0	15	10	5	0	0	0	0	29	29	29	8.85	13.75	0.433	12	8.85	13.75	0.433	12
30167	C	R31	1	ANDON	DOOLAN	0	5	5/19/96	11:05	3680A	1	1712554	1715573	0	41	24	17	4	3	0	0	92	92	92	1.05	1.9	0.317	13	1.05	1.9	0.317	13
30179	C	R31	1	BARRETT	DOOLAN	0	2	5/16/96	11:31	3601A	1	2596961	2546788	0	27	19	10	0	0	0	0	48	48	48	19.99	24.95	0.430	14	19.99	24.95	0.430	14
30169	C	R31	1	BARRETT	SASSO	0	4	5/16/96	11:42	3637B	1	1570961	1572960	0	27	27	12	0	0	0	0	13	13	13	21.95	182.85	0.438	15	21.95	182.85	0.438	15
30155	C	R31	1	BARRETT	DOOLAN	0	1	6/10/96	12:00	3696A	1	235770	2360101	0	9	10	0	0	0	0	0	45	45	45	5.83	7.65	0.345	16	5.83	7.65	0.345	16
30180	C	R31	1	BARRETT	DOOLAN	0	6	5/10/96	12:12	3614A	1	2685636	2686025	0	41	20	11	3	0	0	0	67	67	67	33.61	26.67	0.403	17	33.61	26.67	0.403	17
30132	C	R31	1	DONOHUE	DOOLAN	0	3	5/21/96	12:30	3622A	1	693023	694978	0	25	17	9	0	0	0	0	59	59	59	38.25	38.25	0.510	18	38.25	38.25	0.510	18
30109	C	R31	1	DEMSEY	ANDON	0	2	5/13/96	12:36	3624A	1	3472672	347457	0	19	31	12	0	0	0	0	75	75	75	19.55	23.65	0.438	19	19.55	23.65	0.438	19
30164	C	R31	1	DEMSEY	ANDON	0	2	5/13/96	12:36	3624A	1	3472672	347457	0	19	31	12	0	0	0	0	75	75	75	19.55	23.65	0.438	20	19.55	23.65	0.438	20
30109	C	R31	1	DEMSEY	ANDON	0	2	5/13/96	12:36	3624A	1	3472672	347457	0	19	31	12	0	0	0	0	75	75	75	19.55	23.65	0.438	21	19.55	23.65	0.438	21
30164	C	R31	1	DEMSEY	ANDON	0	2	5/13/96	12:36	3624A	1	3472672	347457	0	19	31	12	0	0	0	0	75	75	75	19.55	23.65	0.438	22	19.55			



Table B-3.1 (cont.)

Rec. No.	Probl.	Ref. No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Reg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. Jz	St. Pass	A. Fee	N. Fee	Inb.	Outb.	PAX	Fare Box	FB Est.	PR OK'd	Used FB	Cor.	Calc. of Fare	Evaton	Av. PR	n
30130		C R31	1	SASSO	DOOLAN	4	5/12/96	14:00	3618A	1	3067495	2046701	1	29	26	13	6	5			66	79		23.06	29.85	YES	29.65	2342.35	23.06	27.63	0.375	1
30131		C R31	1	SASSO	DOOLAN	4	5/15/96	14:00	3692B	1	2543046	3544577	1	30	25	5	2		4		68	66		15.31	27.3	YES	15.31	1801.80	15.31	29.63	0.414	2
30132		C R31	1	SASSO	DONOHUE	4	5/18/96	14:00	3678A	1	1770117	1770946	1	16	18	4	3		2		30	43		8.29	15.6	YES	8.29	670.80	8.29	15.6	0.363	3
30133		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	3798106	3798551	0	5	6	0	1				5			4.45	4.65	YES	4.45	60.45	4.45	4.65	0.358	4
30134		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	690978	69598	0	8	11	4	0				35	23		5.3	7.6	YES	5.3	74.80	5.3	7.6	0.330	5
30135		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	690978	69598	0	8	11	4	0				35	23		5.3	7.6	YES	5.3	74.80	5.3	7.6	0.330	6
30136		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	1770276	1772394	1	36	25	7	1		3		18	72		21.18	32.4	YES	21.18	232.80	21.18	32.4	0.450	7
30137		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	8
30138		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	9
30139		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	10
30140		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	11
30141		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	12
30142		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	13
30143		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	14
30144		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	15
30145		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	16
30146		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	17
30147		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	18
30148		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	19
30149		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	20
30150		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	21
30151		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	22
30152		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	23
30153		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	24
30154		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	25
30155		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	26
30156		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	27
30157		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	28
30158		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	29
30159		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	30
30160		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	31
30161		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	32
30162		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	33
30163		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	34
30164		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	35
30165		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	36
30166		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	37
30167		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	38
30168		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	39
30169		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	40
30170		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	41
30171		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	42
30172		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	43
30173		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	44
30174		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	45
30175		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	46
30176		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	47
30177		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A	1	2595401	2595626	0	8	4	0	0				11	10		4.25	6.8	YES	4.25	86.20	4.25	6.8	0.567	48
30178		C R31	1	SASSO	DONOHUE	4	5/22/96	15:04	3678A																							

Table B-3.2  
Trip Sample Records: Weekend Surface Green Line - C Inbound

Rec No	Prob	Ref No	Dir	Obs	Rec	Day	Date	Time	Veh No	Car	Reg	End	Bill	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. Fee	N. Fee	Inh	Outb	PAX	Fare Box	Est.	FR OK?	Used FR	Cor.	Calc. of Fare	Elevation	Av. FB	n
30103		C 831	1	DOOLAN	DONOHUE	1	5/12/96	12:12	3641B		1	49K001 500151	4	36	30	5	1	0	10	3	3	66	40	44	22.5	30.8	YES	30.80	2371.60	30.8	0.430	2
30102		C 831	1	ANDON	DEMPSEY	1	4/28/96	12:31	3697A		1	380075 380285	0	15	20	5	1	0	3	3	40	40	41	15.1	14.15	NO	14.15	622.60	18.25	0.322	3	
30097		C 831	1	DONOHUE	DOOLAN	1	5/19/96	15:07	3619B		1	2491214 2493059	0	28	25	11	0	0	7	7	61	40	57	18.25	17.20	YES	17.20	980.40	13.6	0.366	4	
30098		C 831	1	BARRETT	DOOLAN	1	4/28/96	15:07	3697A		1	3602245 3603645	0	20	24	1	0	0	12	12	23	48	57	13.6	13.6	YES	7.60	190.00	13.6	0.302	5	
30099		C 831	1	DOOLAN	DONOHUE	1	5/12/96	16:59	3692A		1	397052 397052	0	8	14	2	1	0	5	5	25	25	25	15.25	15.45	YES	15.45	803.40	15.25	0.297	6	
30096		C 831	1	DONOHUE	SASSO	1	4/28/96	17:38	3612B		1	2144655 2148380	0	17	25	5	0	0	5	5	38	38	52	10.79	10.79	YES	10.80	432.00	10.79	0.270	7	
30091		C 831	1	BARRETT	DOOLAN	1	4/28/96	18:09	3620B		1	321850 3219729	0	12	21	1	1	0	5	5	18	18	26	11.72	11.72	YES	14.45	375.70	11.72	0.270	8	
30090		C 831	1	ANDON	DEMPSEY	1	5/19/96	18:22	3639A		1	1412637 1413869	0	17	8	0	0	0	1	1	18	18	26	11.8	11.8	YES	14.45	375.70	11.8	0.400	9	
30093		C 831	1	DONOHUE	SASSO	1	5/19/96	18:29	3639A		1	1385977 1387157	0	20	14	3	0	0	7	7	31	31	19	11.8	11.8	YES	17.60	774.40	11.8	0.400	9	
30094		C 831	1	BARRETT	SASSO	1	4/28/96	18:30	3653B		1	162043 162723	2	8	7	0	0	0	4	4	17	17	19	13.2	13.2	NO	6.80	172.00	13.2	0.358	10	
30095		C 831	1	BARRETT	SASSO	1	5/19/96	19:10	3623B		1	167503 168703	0	20	21	0	0	0	8	8	35	40	49	15.45	15.45	YES	17.00	833.00	15	0.454	11	
30100		C 831	1	BARRETT	ANDON	1	4/21/96	21:58	3644B		1	2546675 2547024	0	12	9	1	0	0	10	10	16	16	22	7.49	7.49	YES	15.45	525.30	7.49	0.473	12	
30103		C 831	1	BARRETT	SASSO	1	5/8/96	22:40	3634A		1	2248171 2248931	0	13	10	0	2	0	2	2	20	20	24	8.1	8.1	YES	11.85	296.25	8.1	0.474	13	
30101		C 831	1	BARRETT	ANDON	1	4/21/96	23:16	3644B		1	2547334 2549029	0	6	6	0	0	0	4	4	14	14	15	3.55	3.55	YES	5.10	71.40	3.55	0.364	15	
30095		C 831	1	BARRETT	SASSO	1	5/19/96	23:20	3609B		1	2693774 2694029	1	3	8	0	0	0	4	4	11	15	15	3.55	2.55	NO	2.55	38.25	3.4	0.425	17	
30193		C 831	1	DEMPSEY	DOOLAN	1	5/11/96	6:00	3607B		1	2924625 2925665	0	4	4	0	0	0	0	0	8	8	15	8	3.4	3.4	YES	3.40	27.20	3.4	0.401	18
30197		C 831	1	ANDON	DEMPSEY	1	5/11/96	9:00			1	2894952 2897272	0	40	37	7	0	0	0	0	22	72	84	23.2	35.4	YES	35.40	2973.60	23.2	0.521	19	
30198		C 831	1	BARRETT	SASSO	1	5/11/96	9:08	3610B		1	3335048 3335467	0	8	14	4	0	0	0	0	66	66	69	11.45	11.45	YES	30.25	2087.25	20.95	0.434	20	
30199		C 831	1	DONOHUE	DOOLAN	1	5/18/96	9:45	3605B		1	2493551 2495546	0	16	13	2	0	0	2	2	45	46	48	23.2	19.70	NO	19.70	945.60	23.2	0.410	22	
30204		C 831	1	DONOHUE	ANDON	1	5/11/96	10:20	3605B		1	1972362 1974407	0	22	21	5	0	0	0	0	60	66	66	23.2	27.55	YES	27.55	1653.00	23.2	0.439	23	
30188		C 831	1	DEMPSEY	DONOHUE	1	4/20/96	10:20	3637A		1	1673409 1673409	0	33	25	11	0	0	0	0	85	85	85	23.2	30.65	YES	30.65	2685.25	22.3	0.361	24	
30192		C 831	1	DEMPSEY	DOOLAN	1	5/11/96	10:22	3637A		1	2361514 2363734	1	31	24	4	1	0	1	1	75	75	85	22.3	30.65	YES	30.65	2685.25	22.3	0.361	25	
30190		C 831	1	DONOHUE	ANDON	1	5/11/96	11:05	3637A		1	3924411 3926441	0	33	39	11	1	0	0	0	57	57	65	26.35	26.75	YES	26.75	1692.90	26.35	0.321	26	
30186		C 831	1	DONOHUE	ANDON	1	5/18/96	12:15	3664B		1	1376631 1378166	1	34	18	4	0	0	0	0	50	60	61	14.65	14.65	YES	24.40	148.40	14.65	0.400	26	
30185		C 831	1	BARRETT	SASSO	1	5/18/96	18:38	3614B		1	1347600 1349065	0	28	30	3	0	0	0	0	20	20	20	9.56	10.2	YES	10.20	204.00	9.56	0.510	27	
30190		C 831	1	SASSO	ANDON	1	4/20/96	20:43	3608A		1	1642823 1643779	0	12	9	1	1	0	11	11	28	28	36	15.5	15.5	YES	12.50	450.00	15.5	0.347	28	
30184		C 831	1	BARRETT	SASSO	1	5/18/96	22:50	3623B		1	161441 162691	3	14	9	1	0	0	93	0	0	42	42	42	16.73	16.73	NO	16.73	450.00	14.17	0.388	29
													Sum	527	486	87	8	0	0	0	0	0	0	22.0			9.279	192.876	23.1	0.083		
													%	0.439	0.405	0.072	0.007	0.000	0.077	0.000	STDEV	0.51	0.51	0.51	0.35	9.279	192.876	23.1	0.083			
													1201													0.55	0.106	22.0	0.94	8.7		
													Tolerance													22.0	0.94	8.7				

Table B-3.3  
Trip Sample Records: Weekday Surface Green Line - C Outbound

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n
30573	C	831	0	DOOLAN	BARRETT	5	5/16/96	5:30	3688B	1									0	0		12	1

Sum	0
Mean	0
STDEV	0
COV	0
Tolerance	0.0 %

30578	C	831	0	DEMPSEY	BARRETT	5	5/30/96	6:01	3680A	1														9	1	
30567	C	831	0	DONOHUE	DEMPSEY	4	5/22/96	6:03	3609B	1															10	2
30556	C	831	0	SASSO	DONOHUE	4	4/24/96	6:11	3674A	1															3	3
30592	C	831	0	ANDON	SASSO	6	5/10/96	6:11	3649B	1															5	4
30600	C	831	0	DEMPSEY	DONOHUE	6	5/10/96	6:24	3691A	1															8	5
30594	C	831	0	DEMPSEY	DONOHUE	6	4/19/96	6:28	3622B	1															13	6
30580	C	831	0	DONOHUE	ANDON	5	5/30/96	6:43	3641A	1															8	7
30557	C	831	0	DONOHUE	ANDON	4	5/29/96	6:55	3630A	1															16	8
30553	C	831	0	DEMPSEY	ANDON	4	4/24/96	7:08	3643B	2															12	9
30560	C	831	0	BARRETT	ANDON	4	5/22/96	7:15	3685A	1															29	10
30585	C	831	0	ANDON	DOOLAN	5	5/9/96	7:16	3668B	2															8	11
30554	C	831	0	BARRETT	DOOLAN	4	4/24/96	7:21	3670A	2															8	12
30596	C	831	0	SASSO	ANDON	6	4/19/96	7:52	3621B	1															21	13
30597	C	831	0	SASSO	ANDON	6	4/19/96	8:14	3672A	1															33	14
30575	C	831	0	DEMPSEY	ANDON	5	5/16/96	8:18	3675A	1															19	15
30583	C	831	0	DEMPSEY	DONOHUE	5	5/9/96	8:46	3668	1															32	16

Sum	110
Mean	6.9
STDEV	5.2
COV	0.76
Tolerance	41.6 %

Table B-3.3 (cont.)  
Trip Sample Records: Weekday Surface Green Line - C Outbound

Imp Sample record																							
Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A free	N free	Inb.	Outb.	n
30598	C	831	0	DEMPSEY	DONOHUE	6	4/19/96	9:10	3640B	2									6				6
30552	C	831	0	DONOHUE	SASSO	4	4/24/96	9:29	3678B	1									11				10
30591	C	831	0	BARRETT	DOOLAN	6	4/19/96	9:30	3622B	2									5				5
30559	C	831	0	DEMPSEY	BARRETT	4	5/29/96	9:46	3448A	1									10				24
30577	C	831	0	DEMPSEY	BARRETT	5	5/30/96	9:50	3689B	2									5				10
30595	C	831	0	DEMPSEY	BARRETT	6	5/31/96	9:55	3630A	2									6				9
30563	C	831	0	BARRETT	ANDON	4	5/22/96	10:05	3608A	1									10				18
30586	C	831	0	ANDON	DOOLAN	5	5/9/96	10:06	3620B	1									3				6
30579	C	831	0	ANDON	DONOHUE	5	5/30/96	10:15	3651B	1									18				26
30593	C	831	0	SASSO	ANDON	6	5/10/96	10:29	3691B	1									17				26
30590	C	831	0	BARRETT	DOOLAN	6	5/10/96	10:42	3680B	1									9				17
30558	C	831	0	DONOHUE	ANDON	4	5/29/96	10:50	3682A	1									16				16
30555	C	831	0	BARRETT	DOOLAN	4	4/24/96	10:51	3698A	1									10				13
30574	C	831	0	BARRETT	SASSO	5	5/16/96	11:09	3671A	1									22				37
30566	C	831	0	DONOHUE	DEMPSEY	4	5/22/96	11:23	3601B	1									20				37
30589	C	831	0	BARRETT	DOOLAN	6	5/10/96	11:40	3696B	1									20				30
30587	C	831	0	ANDON	DOOLAN	5	5/9/96	12:12	3622A	1									21				41
30582	C	831	0	BARRETT	DONOHUE	5	4/25/96	12:16	3637A	1									28				72
30571	C	831	0	BARRETT	SASSO	4	5/15/96	12:25	3675B	1									5				17
30588	C	831	0	BARRETT	DOOLAN	6	5/10/96	12:25	3668A	1									12				20
30603	C	831	0	DONOHUE	DEMPSEY	6	5/10/96	12:30	3639A	1									12				19
30522	C	831	0	DONOHUE	DOOLAN	2	5/13/96	12:35	3693B	1									21				28
30570	C	831	0	DONOHUE	DOOLAN	4	5/15/96	12:40	3621B	1									22				41
30568	C	831	0	ANDON	DEMPSEY	4	5/15/96	13:05	3636A	1									29				33
30565	C	831	0	SASSO	DOOLAN	4	5/22/96	13:12	3673A	1									26				70
30550	C	831	0	DONOHUE	DOOLAN	4	5/8/96	13:21	3659B	1									18				28
30538	C	831	0	SASSO	DONOHUE	3	5/28/96	13:48	3663B	1									20				63
30599	C	831	0	DONOHUE	DEMPSEY	6	4/19/96	13:55	3655A	1									9				13
													Sum	411									
													Mean	14.7									
													STDEV	7.5									
													COV	0.51									
													Tolerance	21.4 %									

**Table B-3.3 (cont.)**  
**Trip Sample Records: Weekday Surface Green Line - C Outbound**

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n								
30515	C	831	0	ANDON	DEMPSEY	2	5/20/96	14:12	3601A	1									21				54								
30508	C	831	0	BARRETT	SASSO	2	5/20/96	14:27	3619A	1									17				26								
30541	C	831	0	BARRETT	SASSO	3	4/23/96	14:33	3643A	1									44				74								
30532	C	831	0	DEMPSEY	ANDON	3	5/21/96	14:37	3653B	1									21				42								
30520	C	831	0	BARRETT	SASSO	2	5/13/96	14:44	3684A	1									23				63								
30572	C	831	0	BARRETT	SASSO	4	5/15/96	15:09	3688B	2									11				22								
30542	C	831	0	DEMPSEY	ANDON	3	4/23/96	15:10	3690B	1									28				41								
30527	C	831	0	DONOHUE	DOOLAN	3	5/21/96	15:26	3649A	2									5				10								
30536	C	831	0	ANDON	DEMPSEY	3	5/28/96	15:26	3631A	1									46				52								
30561	C	831	0	DONOHUE	DOOLAN	4	5/15/96	15:38	3675A	2									19				25								
30513	C	831	0	DONOHUE	DOOLAN	2	5/20/96	15:43	3675A	2									10				25								
30569	C	831	0	ANDON	DEMPSEY	4	5/15/96	15:44	3636	1									15				46								
30581	C	831	0	DONOHUE	BARRETT	5	4/25/96	15:51	3691B	2									20				36								
30521	C	831	0	DONOHUE	DOOLAN	2	5/13/96	15:55	3694A	1									31				18								
30519	C	831	0	BARRETT	SASSO	2	5/13/96	15:57	3677A	2									8				14								
																			Sum	319											

30530	C	831	0	BARRETT	SASSO	3	5/21/96	16:03	3614B	2														38															
30564	C	831	0	SASSO	DOOLAN	4	5/22/96	16:17	3618A	1														71															
30524	C	831	0	BARRETT	SASSO	3	5/14/96	16:20	3687B	2														27															
30551	C	831	0	DONOHUE	DOOLAN	4	5/8/96	16:30	3678B	1														71															
30531	C	831	0	BARRETT	SASSO	3	5/21/96	17:10	3601B	2														24															
30517	C	831	0	ANDON	DEMPSEY	2	5/13/96	17:31	3423B	2														88															
30525	C	831	0	DONOHUE	DEMPSEY	3	5/14/96	17:31	3658B	2														83															
30584	C	831	0	BARRETT	SASSO	5	5/9/96	17:32	3668B	2														95															
30518	C	831	0	BARRETT	SASSO	2	5/13/96	17:47	3618A	2														91															
30523	C	831	0	BARRETT	SASSO	3	5/14/96	17:55	3603A	2														98															
30539	C	831	0	BARRETT	SASSO	3	4/23/96	17:55	3619B	2														23															
30528	C	831	0	ANDON	DEMPSEY	3	5/21/96	18:00	3686B	1														75															
																				Sum	186																		
																				Mean	15.5																		
																				STDEV	7.3																		
																				COV	0.47																		
																				Tolerance	29.8 %																		

Table B-3.3 (cont.)  
Trip Sample Records: Weekday Surface Green Line - C Outbound

Rec. No.	Rte	No.	Dit.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n
30504	C	831	0	DONOHUE	DEMPSEY	2	4/22/96	18:01	3640A	1									49				71
30509	C	831	0	BARRETT	SASSO	2	5/20/96	18:01	3651A	2									1				37
30540	C	831	0	ANDON	DEMPSEY	3	4/23/96	18:13	3608A	2									1				40
30526	C	831	0	DONOHUE	DOOLAN	3	5/21/96	18:44	3661A	1									0				69
30514	C	831	0	DONOHUE	DOOLAN	2	5/20/96	18:53		1									24				43
30529	C	831	0	DEMPSEY	ANDON	3	5/21/96	18:54	3632B	1									14				77
30503	C	831	0	DONOHUE	DEMPSEY	2	4/22/96	18:59	3626B	1									11				80
30543	C	831	0	DONOHUE	DEMPSEY	3	5/14/96	19:04	3444	1									10				31
30516	C	831	0	DEMPSEY	ANDON	2	5/13/96	19:07	3538A	2									18				44
30537	C	831	0	BARRETT	DOOLAN	3	5/28/96	19:17	3652A	1									11				41
30547	C	831	0	BARRETT	SASSO	3	5/7/96	19:48	3683A	1									32				53
30548	C	831	0	BARRETT	SASSO	4	5/8/96	20:01	3623B	1									38				96
30544	C	831	0	DONOHUE	DOOLAN	3	5/7/96	20:08	3616A	1									29				76
30495	C	831	0	SASSO	DOOLAN	2	5/6/96	20:31	3613A	1									13				51
30505	C	831	0	DONOHUE	DEMPSEY	2	4/22/96	21:20	3655	1									17				78
30500	C	831	0	BARRETT	ANDON	2	4/22/96	21:26	3628B	1									28				62
30498	C	831	0	BARRETT	ANDON	2	5/6/96	21:27	3698B	1									10				44
30496	C	831	0	DEMPSEY	DONOHUE	2	5/6/96	21:44	3613	1									16				54
30546	C	831	0	BARRETT	SASSO	3	5/7/96	21:55	3619A	1									10				45
30545	C	831	0	DEMPSEY	ANDON	3	5/7/96	22:02	3653B	1									16				29
30502	C	831	0	SASSO	DOOLAN	2	4/22/96	22:15	3608A	1									18				65
30549	C	831	0	BARRETT	SASSO	4	5/8/96	22:15	3634A	1									9				66
30499	C	831	0	BARRETT	ANDON	2	5/6/96	22:23	3612A	1									9				39
30497	C	831	0	SASSO	DOOLAN	2	5/6/96	23:03	3660A	1									10				24
30501	C	831	0	BARRETT	ANDON	2	4/22/96	23:15	3643A	1									4				23
30506	C	831	0	DEMPSEY	DONOHUE	2	4/23/96	0:04	3644A	1									2				11
																					Sum	400	
																					Mean	15.4	
																					STDEV	50.4	
																					COV	3.28	
																					Tolerance	141.4 %	

Table B-3.4  
Trip Sample Records: Weekend Surface Green Line - C Outbound

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n
30393	C	831	0	BARRETT	ANDON	1	4/21/96	20:50	3645B	1									5			37	1
30479	C	831	0	DOOLAN	DONOHUE	1	5/12/96	15:57	3692B	1									15			69	2
30482	C	831	0	DONOHUE	SASSO	1	4/28/96	18:10	3668B	1									33			128	3
30483	C	831	0	DOOLAN	DONOHUE	1	5/12/96	18:24	3641A	1									12			37	4
30484	C	831	0	BARRETT	SASSO	1	5/19/96	18:39	3622B	1									12			41	5
30485	C	831	0	ANDON	DEMPSEY	1	5/19/96	17:32	3628B	1									6			38	6
30486	C	831	0	DONOHUE	DOOLAN	1	5/19/96	18:30	3622A	1									70			110	7
30487	C	831	0	DONOHUE	DOOLAN	1	5/19/96	14:00	3639A	1									27			50	8
30488	C	831	0	BARRETT	SASSO	1	5/19/96	20:45	3620B	1									38			66	9
30489	C	831	0	BARRETT	SASSO	1	5/19/96	22:51	3647A	1									10			45	10
30490	C	831	0	BARRETT	ANDON	1	4/21/96	22:54	3645B	1									3			60	11
30491	C	831	0	DONOHUE	SASSO	1	4/28/96	16:34	3665A	1									28			68	12
30492	C	831	0	BARRETT	DOOLAN	1	4/28/96	17:35	3647B	1									38			110	13
30493	C	831	0	BARRETT	DOOLAN	1	4/28/96	14:28	3668A	1									33			71	14
30494	C	831	0	DEMPSEY	ANDON	1	4/28/96	18:55	3620A	1									41			81	15
30605	C	831	0	DONOHUE	ANDON	7	5/11/96	10:40	3643B	1									52			62	16
30606	C	831	0	DEMPSEY	DOOLAN	7	5/11/96	9:47	3610A	1									7			8	17
30607	C	831	0	DEMPSEY	DOOLAN	7	5/11/96	12:13	3659A	1									22			32	18
30608	C	831	0	BARRETT	SASSO	7	5/11/96	8:20	3676A	1									15			29	19
30609	C	831	0	DEMPSEY	DONOHUE	7	4/20/96	9:56	3644A	1									5			32	20
30610	C	831	0	ANDON	DEMPSEY	7	5/18/96	8:13	3620A	1									15			18	21
30611	C	831	0	DEMPSEY	ANDON	7	5/18/96	11:47	3618A	1									12			36	22
30612	C	831	0	BARRETT	SASSO	7	5/18/96	18:12	3694A	1									9			52	23
30613	C	831	0	BARRETT	SASSO	7	5/18/96	22:25	3623B	1									5			53	24
30614	C	831	0	DONOHUE	DOOLAN	7	5/18/96	8:43	3685A	1									23			6	25
30615	C	831	0	SASSO	ANDON	7	4/20/96	20:24	3608B	1									6			83	26
Sum.																					542		
Mean																					20.8		
STDEV																					16.8		
COV																					0.81		
Tolerance																					34.8 %		

Table B-4.1

[illegible]





### Table B-4.2

[illegible]

Table B-4.3  
Trip Sample Records: Weekday Surface Green Line - D Outbound

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n
30768	D	852	0	BARRETT	SASSO	4	5/15/96	1:57	3407A	2									41			37	1
30763	D	852	0	ANDON	DEMPSEY	4	4/24/96	5:50	3612B	1									13			30	2
																					Sum	54	
																					Mean	27.0	
																					STDEV	19.8	
																					COV	0.73	
																					Tolerance	114.1 %	

30759	D	852	0	BARRETT	ANDON	4	5/22/96	6:03	3610A	1									15			45	1
30782	D	852	0	DEMPSEY	BARRETT	5	5/30/96	6:50	3605A	1									25			36	2
30789	D	852	0	DEMPSEY	BARRETT	6	5/31/96	6:50	3685B	1									35			55	3
30776	D	852	0	ANDON	DEMPSEY	5	5/16/96	6:54	3682A	1									37			71	4
30760	D	852	0	DEMPSEY	BARRETT	4	5/29/96	6:57	3692A	1									23			52	5
30764	D	852	0	DONOHUE	SASSO	4	4/24/96	7:08	3613A	1									51			66	6
30792	D	852	0	DOOLAN	BARRETT	6	5/10/96	7:20	3683A	1									43			37	7
30790	D	852	0	DEMPSEY	ANDON	6	4/19/96	7:29	3658B	1									16			10	8
30788	D	852	0	DONOHUE	ANDON	6	5/31/96	7:56	3627B	1									9			21	9
30795	D	852	0	BARRETT	DOOLAN	6	4/19/96	8:00	3424B	2									4			17	10
30775	D	852	0	DONOHUE	DEMPSEY	4	5/22/96	8:02	3418B	1									18			31	11
30762	D	852	0	ANDON	DEMPSEY	4	4/24/96	8:28	3689A	2									11			55	12
30781	D	852	0	DOOLAN	ANDON	5	5/9/96	8:35	3451A	1									23			73	13
30761	D	852	0	BARRETT	DOOLAN	4	4/24/96	8:40	3633A	1									3			38	14
30791	D	852	0	ANDON	SASSO	6	5/10/96	8:47	3541B	2									7			30	15
30778	D	852	0	DOOLAN	BARRETT	5	5/16/96	8:55	3615B	1									28			32	16
																					Sum	348	
																					Mean	21.8	
																					STDEV	14.2	
																					COV	0.65	
																					Tolerance	35.9 %	

**Table B-4.3 (cont.)  
Trip Sample Records: Weekday Surface Green Line - D Outbound**

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A free	N free	Inb.	Outb.	n
30797	D	852	0	SASSO	ANDON	6	4/19/96	9:20	3689A	2									9	0		8	1
30774	D	852	0	DONOHUE	DEMPSEY	4	5/22/96	9:47	3679B	2									5			13	2
30787	D	852	0	DONOHUE	DONOHUE	6	5/31/96	10:35	3692A	2									31			76	3
30793	D	852	0	DEMPSEY	DONOHUE	6	5/10/96	10:55	3697B	1									14			31	4
30777	D	852	0	DONOHUE	ANDON	5	5/16/96	11:02	3634A	1									43			30	5
30770	D	852	0	DONOHUE	DOOLAN	4	5/15/96	11:15	3615A	1									28			41	6
30772	D	852	0	DONOHUE	ANDON	4	5/15/96	11:34	3526A	1									20			27	7
30779	D	852	0	DONOHUE	DEMPSEY	5	5/9/96	11:40	3645B	2									28			42	8
30786	D	852	0	BARRETT	DOOLAN	6	4/19/96	11:45	3469B	1									6			24	9
30755	D	852	0	DEMPSEY	ANDON	3	4/23/96	12:00	3616B	2									33			60	10
30796	D	852	0	SASSO	ANDON	6	4/19/96	12:12	3634B	1									19				11
30785	D	852	0	ANDON	DONOHUE	5	5/30/96	12:17	3697A	2									9			41	12
30794	D	852	0	DEMPSEY	DONOHUE	6	4/19/96	12:25	3642A	2									52			76	13
30745	D	852	0	DONOHUE	DOOLAN	2	5/20/96	12:50	3652A	1									11			36	14
30738	D	852	0	DEMPSEY	ANDON	2	5/13/96	13:10	3610B	1									32			75	15
30750	D	852	0	BARRETT	SASSO	3	5/14/96	13:32	3669A	1									Sum	340			16
																					Mean	21.3	
																					STDEV	14.8	
																					COV	0.69	
																					Tolerance	38.2 %	

30758	D	852	0	DEMPSEY	ANDON	3	5/28/96	14:04	3679A	1									35			53	1
30771	D	852	0	DONOHUE	ANDON	4	5/15/96	14:22	3618B	1									72			71	2
30773	D	852	0	DOOLAN	SASSO	4	5/22/96	14:35	3670A	2									14			29	3
30784	D	852	0	BARRETT	DONOHUE	5	4/29/96	14:38	3640A	2									68			83	4
30746	D	852	0	BARRETT	SASSO	3	5/21/96	14:58	3451A	2									19			49	5
30749	D	852	0	DONOHUE	DEMPSEY	3	5/14/96	15:26	3449A	1									13			61	6
30767	D	852	0	DONOHUE	ANDON	4	5/8/96	15:27	3415A	1									27			46	7
30780	D	852	0	BARRETT	SASSO	5	5/9/96	15:27	3539B	2									67			45	8
30742	D	852	0	DONOHUE	ANDON	2	5/20/96	15:32	3646A	1									29			49	9
30732	D	852	0	BARRETT	SASSO	2	4/23/96	15:53	3674A	1									6			76	10
30740	D	852	0	BARRETT	SASSO	2	5/20/96	15:54	3519A	1									19			35	11
																					Sum	369	
																					Mean	33.5	
																					STDEV	24.2	
																					COV	0.72	
																					Tolerance	47.8 %	

Table B-4.3 (cont.)  
Trip Sample Records: Weekday Surface Green Line - D Outbound

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n
30737	D	852	0	DEMPSEY	ANDON	2	5/13/96	16:13	3699B	1									14			35	1
30753	D	852	0	ANDON	DEMPSEY	3	3/23/96	16:13	3669B	1									37			50	2
30747	D	852	0	DONOHUE	DOOLAN	3	5/21/96	16:32	3645A	1									17			28	3
30757	D	852	0	BARRETT	DOOLAN	3	5/28/96	16:33	3643B	2									25			65	4
30743	D	852	0	DONOHUE	DOOLAN	2	5/20/96	16:55	3539B	2									22			35	5
30766	D	852	0	DEMPSEY	ANDON	4	5/8/96	17:01	3415A	1									83			47	6
30739	D	852	0	DONOHUE	DOOLAN	2	5/13/96	17:20	3689B	2									19			150	7
30756	D	852	0	SASSO	DONOHUE	3	5/28/96	17:56	3697B	1									17			52	8
Sum																				234			
Mean																				29.3			
STDEV																				22.9			
COV																				0.78			
Tolerance																				60.8 %			

30765	D	852	0	DONOHUE	DOOLAN	4	5/8/96	18:02	3632B	1									19			42	1
30735	D	852	0	DEMPSEY	DONOHUE	2	5/6/96	18:03	3642B	2									13			63	2
30783	D	852	0	DONOHUE	BARRETT	5	4/25/96	18:05	3612B	1									23			104	3
30741	D	852	0	DEMPSEY	ANDON	2	5/20/96	18:08	3519A	2									63			125	4
30731	D	852	0	BARRETT	ANDON	2	4/22/96	18:25	3449B	1									12			32	5
30748	D	852	0	BARRETT	SASSO	3	5/7/96	18:34	3662A	1									5			48	6
30734	D	852	0	SASSO	DOOLAN	2	5/6/96	18:36	3685A	1									12			95	7
30733	D	852	0	ANDON	BARRETT	2	5/6/96	18:47	3643B	1									12			68	8
30744	D	852	0	BARRETT	SASSO	2	5/20/96	18:55	3423A	2									6			38	9
30752	D	852	0	DONOHUE	DOOLAN	3	5/7/96	18:55		1									8			28	10
30754	D	852	0	BARRETT	SASSO	3	4/23/96	19:00	3629A	2									7			56	11
30751	D	852	0	DEMPSEY	ANDON	3	5/7/96	19:12	3614B	1									44			140	12
30729	D	852	0	DONOHUE	DEMPSEY	2	4/22/96	19:49	3689A	1									13			80	13
30730	D	852	0	DONOHUE	DOOLAN	2	4/22/96	20:02	3634B	1									20			90	14
30769	D	852	0	SASSO	DOOLAN	4	5/8/96	22:58	3641A	1									8			66	15
30736	D	852	0	BARRETT	ANDON	2	5/6/96	23:10	3627A	1									9			52	16
Sum																				274			
Mean																				17.1			
STDEV																				15.5			
COV																				0.90			
Tolerance																				49.7 %			

**Table B-4.4**  
**Trip Sample Records: Weekend Surface Green Line - D Outbound**

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n
30718	D	852	0	BARRETT	SASSO	1	5/19/96	19:35	3642	1									12			68	1
30719	D	852	0	DONOHUE	DOOLAN	1	5/19/96	12:40	3440A	1									60			78	2
30720	D	852	0	DONOHUE	DOOLAN	1	5/19/96	15:39	3696B	1									16			39	3
30721	D	852	0	DEMPSEY	ANDON	1	5/19/96	15:57	3609A	1									85			150	4
30722	D	852	0	DOOLAN	DONOHUE	1	5/10/96	14:05	3626	1									23			73	5
30723	D	852	0	DEMPSEY	ANDON	1	4/28/96	14:53	3646B	1									19			27	6
30724	D	852	0	BARRETT	DOOLAN	1	4/28/96	13:10	3652A	1									10			18	7
30725	D	852	0	BARRETT	DOOLAN	1	4/28/96	15:29	3674A	1									56			120	8
30726	D	852	0	DONOHUE	SASSO	1	4/28/96	19:10	3663	1									28			36	9
30727	D	852	0	DEMPSEY	DONOHUE	1	4/21/96	18:54	3685A	1									6			97	10
30728	D	852	0	BARRETT	ANDON	1	4/21/96	17:35	3674A	1									18			90	11
30798	D	852	0	DEMPSEY	DONOHUE	7	4/20/96	7:22	3674	1									11			14	12
30799	D	852	0	DONOHUE	DEMPSEY	7	4/20/96	10:42	3600B	1									3			24	13
30800	D	852	0	DONOHUE	DEMPSEY	7	4/20/96	12:13	3600A	1									8			15	14
30801	D	852	0	SASSO	ANDON	7	4/20/96	18:57	3699A	1									8			48	15
30802	D	852	0	SASSO	ANDON	7	4/20/96	21:19	3687B	1									30			57	16
30803	D	852	0	DOOLAN	DONOHUE	7	5/18/96	6:35	3679A	1									10			18	17
30804	D	852	0	DEMPSEY	ANDON	7	5/18/96	6:45	3670B	1									10			20	18
30805	D	852	0	ANDON	DEMPSEY	7	5/18/96	10:36	3615B	1									11			37	19
30806	D	852	0	BARRETT	SASSO	7	5/18/96	19:01	3643A	1									16			56	20
30807	D	852	0	BARRETT	SASSO	7	5/11/96	9:29	3663B	1									15			17	21
30808	D	852	0	DONOHUE	ANDON	7	5/11/96	11:31	3663B	1									20			60	22
30809	D	852	0	ANDON	DONOHUE	7	5/11/96	8:38	3650A	1									11			51	23
30810	D	852	0	DEMPSEY	DOOLAN	7	5/11/96	6:21	3613B	1									13			28	24
30811	D	852	0	DEMPSEY	DOOLAN	7	5/11/96	10:48	3627A	1									25			27	25
30812	D	852	0	BARRETT	SASSO	7	5/11/96	6:47	3627A	1									12			26	26
																					Sum	536	
																					Mean	20.6	
																					STDEV	18.8	
																					COV	0.91	
																					Tolerance	39.4 %	

Table B-5.1  
Trip Sample Records: Weekday Surface Green Line - E Inbound

Rec. No.	Prob.	Re	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Reg.	End	Bits	Ad. Ckpt	Ad. Pass	Red.	Sr. 12	Sr. Pass	A. Free	N. Free	Inb.	Outb.	PAX	Far. Box	FB Est.	FB OK?	Used	FB Cor.	Calc. of Fare	Elevation	Av. FR
30234	E	880	1	DEMISEY	ANDON	4	4/24/96	5:30	3649B	1	256432	250637	0	3	9	1	0	0	0	0	33	33	13	2.05	2.75	YES	9.35	308.35	6.95	9.35	0.281
30248	E	880	1	DONOHUE	DEMISEY	4	5/22/96	5:40	3622A	1	256432	250637	0	3	9	1	0	0	0	0	12	12	13	2.05	2.75	YES	9.35	308.35	6.95	9.35	0.281
30250	E	880	1	BARRETT	ANDON	4	5/22/96	5:50	3619A	1	256432	250637	0	4	9	3	0	0	0	0	17	17	18	11.06	4.00	4.00	NO	72.00	2.05	2.75	0.222
30253	E	880	1	SASSO	ANDON	6	5/10/96	5:50	3609A	1	214808	214846	1	6	14	1	0	0	0	0	18	18	21	5.48	5.3	5.3	YES	121.90	5.48	5.3	0.230
30278	E	880	1	BARRETT	DOOLAN	6	4/19/96	6:00	3662B	1	1354056	1355756	2	14	2	1	0	0	0	0	28	28	21	7.05	12.1	NO	12.10	254.10	7.05	12.1	0.576
30281	E	880	1	DEMISEY	ANDON	4	5/29/96	6:20	3600A	1	2745285	2745990	0	14	23	1	0	0	0	0	23	23	38	12.13	19.75	YES	19.75	1204.75	12.13	19.75	0.318
30284	E	880	1	BARRETT	DEMISEY	5	5/31/96	6:30	3651A	1	1997303	2577918	0	15	28	5	0	0	0	0	55	55	61	6.15	13.75	NO	13.75	673.75	6.15	13.75	0.281
30287	E	880	1	DOOLAN	BARRETT	6	5/10/96	7:00	3681B	1	2922396	2933366	4	28	44	2	2	0	0	0	62	62	81	13.7	25	YES	25.00	2025.00	13.7	25	0.309
30292	E	880	1	BARRETT	SASSO	4	5/29/96	7:11	3607A	1	212300	235590	2	50	61	2	0	0	0	0	87	87	113	44.9	42.9	YES	42.90	447.70	44.9	42.9	0.380
30297	E	880	1	DONOHUE	DEMISEY	4	5/22/96	7:28	3611A	1	1350966	1357001	0	13	19	0	0	0	0	0	31	31	35	6.2	11.25	YES	11.25	393.75	6.2	11.25	0.321
30299	E	880	1	SASSO	ANDON	6	4/19/96	7:28	3611A	1	1350966	1357001	0	17	30	0	0	0	0	0	44	44	48	10.35	14.45	YES	14.45	693.60	10.35	14.45	0.301
30303	E	880	1	ANDON	DONOHUE	1	5/31/96	7:36		1	1974672	1974977	0	12	37	0	0	0	0	0	47	47	54	2.55	10.2	NO	10.20	550.80	2.55	10.2	0.189
30308	E	880	1	DEMISEY	DONOHUE	2	22/07/23	221828		2	220723	221828	0	24	24	0	0	0	0	0	37	37	48	11.05	20.4	YES	20.40	979.20	11.05	20.4	0.425
30314	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:16	3686B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30321	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30325	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30327	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30328	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30329	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30330	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30331	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30332	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30333	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30334	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30335	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30336	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30337	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30338	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30339	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30340	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30341	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30342	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30343	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30344	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30345	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30346	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30347	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30348	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30349	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30350	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30351	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30352	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30353	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30354	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30355	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	0.243
30356	E	880	1	DOOLAN	BARRETT	5	5/16/96	8:32	3654B	1	2594084	2595169	0	14	34	2	2	0	0	0	48	48	54	10.85	13.1	YES	13.10	707.40	10.85	13.1	

Table B-5.1 (cont.)

[illegible]



Table B-5.2

### Trip Sample Records: Weekend Surface Green Line - E Inbound

Rec. No.	Prob.	Re No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Reg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Sta.	A. Free	Inb.	Outb.	PAX	Free Box	FB Est.	FB OK?	Lined FB	Cor.	Calc. of Fare	Evation	Av. FB	n	
30210	E 880	1	DOOLAN	DOONHOE	1	5/12/96	5:48	3604A	1	258090	2582955	3	40	14	2	0	0	0	2	2	47	58	38	22.55	34.4	YES	34.40	1995.00	22.55	34.4	0.993	1
30208	E 880	1	DOONHOE	DOOLAN	1	5/12/96	12:22	3604A	1	3521849	3522924	1	31	24	1	0	0	0	6	6	51	62	60	11.75	26.95	NO	14.15	1646.10	15.46	20.1	0.928	2
30018	E 880	1	DOONHOE	DEMSEY	1	5/19/96	12:26	3609A	1	1774899	1774624	1	15	1	3	2	0	0	0	2	2	20	20	6.35	14.15	NO	14.15	283.00	15.46	20.1	0.708	3
30011	E 880	1	DEMSEY	ANDON	1	7/20/97	12:35	3609A	1	2294179	2219725	1	22	10	3	2	0	0	0	0	82	87	87	15.46	35.20	YES	20.10	743.70	15.46	20.1	0.545	4
30213	E 880	1	DEMSEY	ANDON	1	5/19/96	12:35	3609A	1	2453191	2453379	4	39	34	5	2	0	0	0	0	82	87	87	15.46	35.20	YES	20.10	743.70	15.46	20.1	0.545	5
30205	E 880	1	DOONHOE	DEMSEY	1	4/21/96	13:09	3609A	1	2453191	2453379	4	39	34	5	2	0	0	0	0	82	87	87	15.46	35.20	YES	20.10	743.70	15.46	20.1	0.545	6
30205	E 880	1	DEMSEY	ANDON	1	4/28/96	13:31	3604A	1	2404290	2403482	0	25	15	4	3	0	0	0	0	31	31	31	13.11	23.25	YES	13.15	140.00	13.11	23.25	0.423	7
30207	E 880	1	DEMSEY	ANDON	1	5/19/96	13:31	36076A	1	3044950	3486114	1	38	41	7	0	0	0	0	0	88	88	88	25.3	44.15	YES	33.70	3201.50	29.22	33.7	0.355	8
30204	E 880	1	DOONHOE	SASSO	1	4/28/96	15:01	3603B	1	2917460	2919882	1	38	41	7	0	0	0	0	0	88	88	88	25.3	44.15	YES	33.70	3201.50	29.22	33.7	0.355	9
30211	E 880	1	DOOLAN	DOONHOE	1	14/02/91	14:08	3604A	1	2917460	2919882	1	38	41	7	0	0	0	0	0	69	69	69	11.4	19.5	YES	11.40	428.40	11.4	19.5	0.400	10
30200	E 880	1	DEMSEY	DOOLAN	1	4/21/96	15:42	3605B	1	3709742	3720772	0	16	13	2	3	0	0	0	0	69	69	69	11.4	19.5	YES	11.40	428.40	11.4	19.5	0.400	11
30209	E 880	1	DOONHOE	DOOLAN	1	4/21/96	16:18	3605A	1	3709742	3720772	0	16	13	2	3	0	0	0	0	75	75	75	18.9	31.00	YES	18.90	812.70	18.9	31.0	0.440	12
30202	E 880	1	DOONHOE	DOOLAN	1	2187362	2187952	3	36	22	13	1	0	0	0	0	0	0	0	16	49	43	18.9	18.9	YES	18.90	812.70	18.9	31.0	0.440	13	
30202	E 880	1	DOONHOE	DOOLAN	1	2730702	2731992	1	22	13	1	0	0	0	0	0	0	0	0	25	25	25	20.05	26.35	YES	26.35	1581.00	20.05	26.35	0.439	13	
30201	E 880	1	DEMSEY	ANDON	1	3/10/03	20:18	3601B	1	3011836	3011836	5	31	22	0	2	0	0	0	7	61	60	60	11.4	19.5	YES	12.95	530.95	11.4	19.5	0.316	14
30199	E 880	1	ANDON	DEMSEY	1	4/28/96	17:47	3601B	1	0	0	0	0	0	0	0	0	0	0	33	33	33	n/a	12.95	NO	12.95	530.95	11.4	19.5	0.316	15	
30202	E 880	1	ANDON	DEMSEY	1	4/28/96	17:47	3601B	1	0	0	0	0	0	0	0	0	0	0	33	33	33	n/a	12.95	NO	12.95	530.95	11.4	19.5	0.316	16	
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	16
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	17
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	18
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	19
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	20
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	21
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	22
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	23
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	24
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	25
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	26
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	27
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	28
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	29
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	30
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	31
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	32
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	33
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	34
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	35
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	36
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	37
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	38
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	39
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	40
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	41
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	42
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0	0	14	4	50	50	11.4	19.5	YES	19.50	975.00	11.4	19.5	0.416	43
30202	E 880	1	DEMSEY	ANDON	1	4/21/96	20:40	3605A	1	381461	382501	0	1	22	12	0	2	0														

Table B-5.3  
Trip Sample Records: Weekday Surface Green Line - E Outbound

Rec. No.	Probl. Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Reg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A_free	N_free	Inb.	Outb.	n
30678	E	880	0	DEMPSEY	ANDON	4	4/24/96	5:01	3649B	1									3				3
30670	E	880	0	DONOHUE	DEMPSEY	4	5/22/96	5:25	3652A	1									7				1
30707	E	880	0	SASSO	ANDON	6	5/10/96	5:35	3690A	1									4				8
30673	E	880	0	BARRETT	ANDON	4	5/22/96	5:37	3619A	1									5				2
30702	E	880	0	BARRETT	DOOLAN	6	4/19/96	5:45	3665B	1									6				26
																					Sum	25	
																					Mean	5.0	
																					STDEV	1.6	
																					COV	0.32	
																					Tolerance	31.1 %	

30656	E	880	0	DONOHUE	DOOLAN	3	5/21/96	6:00	3690B	2									10				43
30689	E	880	0	DEMPSEY	ANDON	5	5/16/96	6:00	3670B	1									1				27
30706	E	880	0	BARRETT	DEMPSEY	6	5/31/96	6:00	3654A	1									3				35
30699	E	880	0	ANDON	DEMPSEY	7	5/18/96	6:04	3686A	1									3				7
30664	E	880	0	DEMPSEY	BARRETT	3	5/29/96	6:06	3600A	1									2				35
30708	E	880	0	DOOLAN	BARRETT	6	5/10/96	6:43	3681B	1									9				56
30704	E	880	0	ANDON	DONOHUE	6	5/31/96	6:58	3665A	2									0				13
30701	E	880	0	SASSO	ANDON	6	4/19/96	7:09		2									0				15
30669	E	880	0	DONOHUE	DEMPSEY	4	5/22/96	7:12	3611A	1									3				78
30687	E	880	0	DEMPSEY	DONOHUE	5	5/9/96	7:57	3686B	2									4				54
30691	E	880	0	DOOLAN	BARRETT	5	5/16/96	8:13	3654B	1									7				53
30679	E	880	0	DONOHUE	SASSO	4	4/24/96	8:45	3622A	1									18				80
																					Sum	60	
																					Mean	5.0	
																					STDEV	5.2	
																					COV	1.05	
																					Tolerance	66.6 %	

**Table B-5.3 (cont.)**  
**Trip Sample Records: Weekday Surface Green Line - E Outbound**

inp sample records

Rec. No.	Probl.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n	
30688	E	880	0	DONOHUE	ANDON	5	5/30/96	9:36	3636B	2										2				40	
30676	E	880	0	DONOHUE	ANDON	4	5/29/96	9:54	3695A	1										8				37	
30697	E	880	0	DONOHUE	DEMPSEY	6	5/10/96	9:56	3662B	1										7				51	
30697	E	880	0	DONOHUE	DEMPSEY	6	5/10/96	9:56	3662B	1										3				34	
30703	E	880	0	ANDON	DONOHUE	6	5/31/96	9:56	3674A	2										3				34	
30665	E	880	0	BARRETT	DOOLAN	4	4/24/96	10:13	3642A	1										8				69	
30692	E	880	0	SASSO	BARRETT	5	5/16/96	10:30	3613A	1										7				31	
30694	E	880	0	DEMPSEY	BARRETT	5	5/30/96	10:55	3629A	1										5				33	
30705	E	880	0	DEMPSEY	REORDER	6	5/31/96	10:56	3665A	2										7				68	
30675	E	880	0	DONOHUE	SASSO	4	4/24/96	11:07	3604A	1										4				24	
30700	E	880	0	BARRETT	DOOLAN	6	4/19/96	11:07	3610A	1										9				69	
30693	E	880	0	ANDON	DONOHUE	5	5/30/96	11:24	3674B	1										9				28	
30686	E	880	0	DOOLAN	ANDON	5	5/9/96	11:31	3690A	1										6				28	
30663	E	880	0	BARRETT	SASSO	4	5/15/96	11:42	3616A	2										29				74	
30672	E	880	0	DOOLAN	SASSO	4	5/22/96	12:19	3637A	1										15				77	
30690	E	880	0	ANDON	DEMPSEY	5	5/16/96	12:20	3684B	1										4				55	
30674	E	880	0	BARRETT	DOOLAN	4	4/24/96	12:24	3632A	2										4				15	
30681	E	880	0	DONOHUE	DOOLAN	4	5/8/96	12:40	3680B	2										8				34	
30651	E	880	0	BARRETT	SASSO	3	5/21/96	12:53	3644B	1										20				53	
30695	E	880	0	DEMPSEY	DONOHUE	5	5/9/96	12:56	3654B	2										9				37	
30680	E	880	0	DEMPSEY	ANDON	4	5/8/96	13:01	3635A	1										3				20	
30655	E	880	0	DEMPSEY	ANDON	3	5/28/96	13:10	3634A	2										13				35	
30683	E	880	0	BARRETT	SASSO	5	5/9/96	13:20	3667B	1														22	
																							Sum		183

30660	E	880	0	DONOHUE DEMPSEY	3	5/14/96	14:33	3644A	1			72	1
30657	E	880	0	DONOHUE DOOLAN	3	5/21/96	14:40	3603A	2			31	2
30666	E	880	0	DONOHUE DOOLAN	4	5/15/96	14:55	3639A	2			29	3
30654	E	880	0	DONOHUE SASSO	3	5/28/96	15:08	3618B	1			32	4
30635	E	880	0	DONOHUE DOOLAN	2	5/13/96	15:14	3654A	1			29	5
30677	E	880	0	DONOHUE DOOLAN	4	5/8/96	15:50	3645A	1			43	6
											Sum	68	
											Mean	11.3	
											STDEV	8.8	
											COV	0.78	
											Tolerance	69.9 %	

**Table B-5.3 (cont.)**  
**Trip Sample Records: Weekday Surface Green Line - E Outbound**

Rec. No.	Probl. Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n
30662	E	880		0 BARRETT	SASSO	4	5/15/96	16:01	3670B	2									14				77
30667	E	880		0 DEMPSEY	ANDON	4	5/15/96	16:34	3604B	2									10				43
30659	E	880		0 DONOHUE	DEMPSEY	3	5/14/96	16:42	3635B	2									3				34
30684	E	880		0 BARRETT	SASSO	5	5/9/96	16:42	3664A	2									2				18
30632	E	880		0 BARRETT	SASSO	2	5/13/96	17:00	3606B	2									10				52
30652	E	880		0 DEMPSEY	ANDON	3	5/21/96	17:11	3679B	2									7				57
30650	E	880		0 BARRETT	SASSO	3	4/23/96	17:15	3635A	1									17				58
30696	E	880		0 DONOHUE	BARRETT	5	4/25/96	17:16	3660A	2									9				56
30636	E	880		0 BARRETT	SASSO	2	5/20/96	17:18	3699A	2									29				67
30649	E	880		0 DEMPSEY	ANDON	3	4/23/96	17:33	3610B	1									7				47
30671	E	880		0 SASSO	DOOLAN	4	5/22/96	17:35	3628B	2									7				92
30653	E	880		0 ANDON	DEMPSEY	3	5/28/96	17:45	3699B	2									7				68
30644	E	880		0 ANDON	DEMPSEY	3	5/7/96	17:55	3607B	1									17				76
																					Sum		
																					Mean		
																					STDEV		
																					COV		
																					Tolerance		
																					41.0 %		

30637	E	880		0 DONOHUE	DOOLAN	2	5/20/96	18:15	3681B	1									15				55
30633	E	880		0 DEMPSEY	ANDON	2	5/13/96	18:30	3675A	1									4				46
30634	E	880		0 DONOHUE	DOOLAN	2	5/13/96	18:40	3613A	1									27				59
30685	E	880		0 BARRETT	SASSO	5	5/9/96	18:50	3607A	1									18				68
30661	E	880		0 BARRETT	SASSO	3	5/14/96	18:52	3684B	1									23				81
30648	E	880		0 DEMPSEY	ANDON	3	5/28/96	19:04	3674B	2									0				18
30647	E	880		0 DEMPSEY	ANDON	3	5/28/96	19:25	3627A	1									2				47
30641	E	880		0 SASSO	DOOLAN	2	5/6/96	19:47	3645A	1									5				28
30698	E	880		0 BARRETT	SASSO	7	5/18/96	20:20	3676A	1									17				38
30640	E	880		0 DEMPSEY	DONOHUE	2	5/6/96	20:59	3664A	1									12				57
30645	E	880		0 BARRETT	SASSO	3	5/7/96	21:08	3602A	1									24				27
30638	E	880		0 SASSO	DOOLAN	2	4/22/96	21:26	3691B	1									12				40
30682	E	880		0 BARRETT	SASSO	4	5/8/96	21:28	3689A	1									18				65
30639	E	880		0 BARRETT	ANDON	2	4/22/96	22:34	3656A	1									12				37
30646	E	880		0 DOOLAN	DONHOE	3	5/7/96	22:54	3635A	1									2				18
30643	E	880		0 DEMPSEY	ANDON	3	5/7/96	22:55	3623B	1									4				15
30642	E	880		0 DEMPSEY	DONOHUE	2	5/6/96	22:58	3668B	1									2				17
																					Sum		
																					Mean		
																					STDEV		
																					COV		
																					Tolerance		
																					40.1 %		

**Table B-5.4**  
**Trip Sample Records: Weekend Surface Green Line -E Outbound**

Rec. No.	Rte	No.	Dir.	Obs.	Rec.	Day	Date	Time	Veh. No.	Car	Beg.	End	Bills	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	A. free	N. free	Inb.	Outb.	n																				
30628	E	880	0	DONOHUE	DOOLAN	1	5/19/96	12:01	3684A	1									7				43	1																			
30629	E	880	0	DEMPSEY	ANDON	1	5/19/96	12:48	3699B	1									0				57	2																			
30616	E	880	0	DEMPSEY	ANDON	1	4/28/96	12:54	3645A	1									1				22	3																			
30623	E	880	0	DONOHUE	DEMPSEY	1	4/21/96	12:54	3665A	1									1				20	4																			
30625	E	880	0	DEMPSEY	ANDON	1	5/19/96	13:12	3676A	1									19				44	5																			
30622	E	880	0	DONOHUE	SASSO	1	4/28/96	14:42	3643A	1									9				73	6																			
30631	E	880	0	DOOLAN	DONOHUE	1	5/12/96	15:20	3650B	1									12				66	7																			
30621	E	880	0	DEMPSEY	DONOHUE	1	4/21/96	16:00	3656A	1									15				71	8																			
30626	E	880	0	DONOHUE	DOOLAN	1	5/19/96	16:42	3669A	1									9				24	9																			
30620	E	880	0	BARRETT	DOOLAN	1	4/28/96	16:44	3608B	1									12				56	10																			
30618	E	880	0	DEMPSEY	ANDON	1	4/28/96	17:27	3610B	1									9				16	11																			
30630	E	880	0	DOOLAN	DONOHUE	1	5/12/96	17:29	3604A	1									5				12	12																			
30619	E	880	0	ANDON	DEMPSEY	1	4/28/96	18:10	3662A	1									9				64	13																			
30617	E	880	0	DEMPSEY	ANDON	1	5/19/96	18:49	3686B	1									5				30	14																			
30624	E	880	0	BARRETT	ANDON	1	4/21/96	20:14	3693A	1									2				8	15																			
30627	E	880	0	BARRETT	SASSO	1	5/19/96	22:10	3669A	1									10				18	16																			
30715	E	880	0	SASSO	BARRETT	1	5/11/96	6:06	3606B	1									2				12	17																			
30709	E	880	0	DEMPSEY	DONOHUE	1	4/20/96	6:26	3692A	1									5				14	18																			
30717	E	880	0	ANDON	DONOHUE	1	5/11/96	7:40	3677A	1									22				31	19																			
30711	E	880	0	DONOHUE	DOOLAN	1	5/18/96	7:54	3635B	1									7				39	20																			
30714	E	880	0	DEMPSEY	DOOLAN	1	5/11/96	9:05	3644B	1									5				24	21																			
30713	E	880	0	DEMPSEY	ANDON	1	5/18/96	9:20	3669A	1									3				22	22																			
30716	E	880	0	DONOHUE	ANDON	1	5/11/96	10:00	3606B	1									2				33	23																			
30712	E	880	0	DONOHUE	DOOLAN	1	5/18/96	10:16	3621B	1									16				36	24																			
30710	E	880	0	SASSO	ANDON	1	4/20/96	20:21	3669A	1									6				30	25																			
																					Sum	193																					
																					Mean	7.7																					
																					STDEV	5.8																					
																					COV	0.75																					
																					Tolerance	33.0 %																					

Table B-6

WE	0.361254	ALL	0.343762
Avgr. FBLR System		WK	0.346977
		WF	0.329475

Table B-6 (cont.)

surf. GLi	total
Factor=	WE
0.56955	week

**Table B-7**  
**Trip Sample Records and Statistical Calculations: Bus and Trackless Trolley**

Rec. No.	Route	Dir.	Garage	Bus #	Day	Date	Surveyor	Sch Time	A/C Time	Rem.	Cash Beg.	Cash End	BU	Ad.	Cash	Ad.	Past	Red.	St. 1/2	St. Past	Transf.	Short	A	Free	N	Free	Free	Box	Est.	FB OK	PAX	Uced	FB Cor.	Calc of Fare	Evation	Av. FB #	OK	
10201	10197	16	O	8882	1	6/16/96	T PINAKAS	11:00	20:40	0	5526.6	5526.7	0	12	19	3	0	0	0	0	0	0	0	0	0	0	0	0	4.1	7.65	NO	34	7.37	250.5	5.6	5.85	0.217	1
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	20:40	20:40	0	18834.2	18839.8	0	9	13	1	1	1	1	1	1	1	1	1	1	1	1	1	5.6	5.85	YES	24	5.60	134.4	5.6	5.85	0.233	2
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	9:20	9:20	0	6588.9	6513.6	1	1	21	6	1	1	1	1	1	1	1	1	1	1	1	1	-74.3	11.4	NO	42	10.96	461.2	5.6	5.85	0.261	3
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	11:23	11:23	0	6299.34	6309.15	0	5	19	6	1	1	1	1	1	1	1	1	1	1	1	1	9.81	6.9	NO	43	6.65	285.8	5.6	5.85	0.155	4
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	6.1	10.35	NO	37	9.97	368.9	5.6	5.85	0.269	5
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	6
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	7
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	8
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	9
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	10
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	11
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	12
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	13
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	14
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	15
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	16
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	17
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	18
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	19
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	20
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	21
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	22
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	23
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	24
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	25
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	26
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	27
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	28
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	29
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	30
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	31
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	32
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	33
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	34
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	35
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	36
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	37
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	38
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	39
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:10	14:10	0	2638.2	2644.3	0	16	18	1	2	1	1	1	1	1	1	1	1	1	1	1	16.4	0.6	NO	25	0.58	14.4	4.9	4.95	0.023	40
10196	10196	16	O	8885	1	7/7/96	T PINAKAS	14:																														



**Table B-7 (cont.)**  
**Trip Sample Records and Statistical Calculations: Bus and Trackless Trolley**

Rec. No.	Route Dir.	Garage	Bus #	Day	Date	Surveyor	Sch Time	Act Time	Rem.	Cash Beg.	Cash End	Bill	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Pass	Transit	Short	A. Free	I. Free	Fare Box	FB Est.	FB OK	PAX Used	FB Cor.	Calc. of Fare	Eva	Av. FB #	OK			
10005	34.6	0 B	25-8		6/12/96	T WILKINS	22:10	22:10	0	0	85736.2	0	16	29	1	0	0	0	0	0	0	85736.2	14.25	NO	50	13.73	686.3	4.8	4.8	0.275	64	26	
10058	35.1	0 B	253	5	6/6/96	T WILKINS	15:30	15:32	0	18953.25	18953.1	0	5	8	6	3	3	0	0	0	0	4.8	4.8	YES	28	4.80	134.4	4.8	4.8	0.171	65	27	
10165	36	1 B	256	3	7/16/96	PAUL LYONS	15:35	15:35	0	26400.13	26401.7	1	2	4	1	0	0	0	0	0	0	2.57	1.35	NO	7	1.30	9.1	4.03	4.8	0.186	66	27	
10146	36.8	1 B	250	3	7/16/96	PAUL LYONS	15:35	15:35	0	5546.82	5550.85	0	5	3	2	5	0	0	0	0	0	4.03	4.8	YES	18	4.03	72.5	4.03	4.8	0.224	67	28	
10021	36.8	0 B	227	3	7/16/96	PAUL LYONS	6:54	6:54	0	1936.16	19038.9	0	1	4	1	0	0	0	0	0	0	0.75	0.75	YES	5	1.20	4.5	0.75	1.2	0.240	69	30	
10033	37	0 B	195	1	6/12/96	PACINNES	5:55	5:58	0	1636.89	1658.1	0	2	3	0	0	0	0	0	0	0	1.2	1.2	YES	6	1.20	6.0	1.2	1.2	0.240	70	31	
10102	39	1 B	232	4	6/12/96	PAUL LYONS	6:06	6:06	0	14564.58	14578.5	0	24	31	3	0	0	0	0	0	0	13.94	15.45	YES	66	13.94	920.0	13.94	15.45	0.211	71	32	
10170	40	1 B	8740	1	6/13/96	PAUL LYONS	7:30	7:30	0	4896.67	4901.68	0	7	20	3	0	0	0	0	0	0	5.01	5.85	YES	54	5.01	270.5	5.01	5.85	0.093	71	32	
10144	41	1 B	8741	3	6/6/96	PACINNES	7:06	7:06	0	29117.13	29117.1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000	72	33
10064	41	0 B	184	5	6/16/96	T WILKINS	7:24	7:24	0	18418.8	18421.7	0	3	6	0	0	0	0	0	0	0	1.7	1.8	YES	11	1.70	18.7	1.7	1.8	0.155	73	34	
10063	41	0 B	8231	3	6/31/96	KEN TERRELL	6:40	6:40	0	5534.73	5543.73	0	5	16	2	0	0	0	0	0	0	2.88	3.6	YES	25	2.88	72.0	2.88	3.6	0.108	75	35	
10087	42	0 B	8257	3	6/11/96	PACINNES	21:00	21:03	0	5538.39	5543.73	0	6	2	1	0	0	0	0	0	0	5.34	4.5	NO	40	4.33	173.4	5.34	4.5	0.280	76	36	
10098	42	1 B	219	4	6/12/96	T WILKINS	14:03	14:05	0	14288.2	14288.2	0	8	4	2	0	0	0	0	0	0	0	0	0	2	0.00	0.0	0	0	0	0.000	78	35
10003	42.1	0 B	243	5	6/6/96	T WILKINS	6:29	6:25	0	13411.41	13411.8	0	0	2	0	0	0	0	0	0	0	0	0	0	2	12.57	527.9	14.85	14.85	0.243	80	36	
10133	43	1 D	121	3	6/11/96	PAUL LYONS	13:44	13:44	0	947.56	982.91	0	0	19	13	5	0	0	0	0	0	35.35	13.05	NO	42	6.07	291.3	6.3	6.3	0.126	88	39	
10143	43	1 D	131	4	6/15/96	PACINNES	13:44	13:44	0	1893.05	18967.9	0	22	23	7	2	4	0	0	0	0	14.85	14.85	YES	46	6.07	291.3	6.3	6.3	0.126	88	39	
10039	43	0 D	115	4	5/29/96	T WILKINS	15:53	15:53	0	9258.9	92568.2	0	13	8	4	3	1	0	0	0	0	9.3	9.3	YES	31	9.30	288.3	9.3	9.3	0.268	81	37	
10042	43	0 D	296	5	5/30/96	T WILKINS	15:09	15:09	4	9258.9	92568.2	0	13	8	4	3	1	0	0	0	0	10.45	9.75	YES	39	10.45	407.5	10.45	9.75	0.268	81	37	
11209	43	0 D	301	6	6/15/96	L SULLIVAN	17:00	17:00	1	7131.74	7141.19	0	1	13	5	1	4	0	0	0	0	10.45	9.75	YES	31	10.45	407.5	10.45	9.75	0.268	81	37	
10024	44.1	0 D	149	3	6/11/96	PAUL LYONS	6:59	6:59	0	1956.11	1966.17	0	8	6	2	1	1	0	0	0	0	1.65	2.4	NO	15	2.31	34.7	1.65	2.4	0.154	83	38	
10051	45	0 D	291	6	6/14/96	T WILKINS	18:24	18:24	0	1956.11	1966.17	0	8	6	2	1	1	0	0	0	0	1.65	2.4	NO	15	2.31	34.7	1.65	2.4	0.154	83	38	
10015	45	0 D	168	6	5/31/96	KEN TERRELL	8:27	8:27	3	1353.25	1355.85	0	2	3	0	0	0	0	0	0	0	0.6	1.2	NO	7	1.16	8.1	0.6	1.2	0.144	86	39	
10132	46	1 B	188	4	6/12/96	PAUL LYONS	13:00	13:00	0	14471.07	14471.1	0	1	3	0	0	0	0	0	0	0	7.5	4.5	NO	21	4.33	91.0	7.5	4.5	0.206	87	39	
10071	47	0 A	8946	4	6/10/96	R MATTILAINA	17:40	17:42	0	231.67	239.17	0	7	11	2	0	0	0	0	0	0	0	0	0	8	1.01	8.1	0	0	0.126	88	39	
10014	48	1 B	8018	5	6/6/96	T WILKINS	14:30	14:30	0	0	0	0	0	0	1	7	0	0	0	0	0	0	0	0	8	1.01	8.1	0	0	0.126	88	39	
10009	49	1 D	135	2	6/10/96	T WILKINS	16:49	16:52	0	16266.5	16266.5	2	7	24	2	0	4	0	0	0	0	16268.5	6.3	NO	46	6.07	291.3	6.3	6.3	0.126	88	39	
10158	49	1 D	311	3	7/19/96	PACINNES	7:03	7:03	0	3407	3422.12	0	20	25	1	1	1	0	0	0	0	6.85	5.7	NO	24	6.07	291.3	6.3	6.3	0.126	88	39	
10083	49	0 D	95	6	6/12/96	PAUL LYONS	7:13	7:13	0	1835.09	1836.8	0	10	9	1	0	0	0	0	0	0	15.12	12.75	NO	51	12.28	626.3	15.12	12.75	0.283	92	39	
10127	49	1 D	303	6	5/31/96	KEN TERRELL	6:00	6:00	8	2543.59	2546.62	0	24	23	3	5	2	0	0	0	0	4.66	7.05	NO	24	6.79	163.0	4.66	7.05	0.235	93	39	
10036	49	0 D	208	6	5/25/96	KEN TERRELL	14:49	14:51	0	408.5	412.32	0	4	7	2	0	5	6	0	0	0	12.57	16.35	NO	67	15.75	1055.1	12.57	16.35	0.235	93	39	
10039	51	0 B	238	5	6/13/96	PAUL LYONS	15:15	15:16	0	5475.13	5482.33	0	9	10	4	0	0	0	0	0	0	3.82	4.2	YES	26	3.82	99.3	3.82	4.2	0.147	94	40	
10095	55	0 D	8006	5	6/19/96	CURTIS SMITH	20:50	20:51	0	26897.73	26906.7	0	15	22	0	0	0	0	0	0	0	7.2	7.2	YES	19	7.20	136.6	7.2	7.2	0.235	93	39	
10162	57	1 A	290	3	6/14/96	PACINNES	11:27	11:27	0	1419.47	1423.07	0	9	10	4	0	0	0	0	0	0	3.6	6.3	NO	25	6.07	451.7	3.6	6.3	0.219	94	40	
10081	57	0 A	8788	8	6/11/96	CURTIS SMITH	8:01	8:01	0	26906.73	26908.1	0	14	15	0	0	0	0	0	0	0	9	9	YES	47	10.98	516.1	9	9	0.235	93	39	
10057	57	0 A	290	4	6/5/96	T WILKINS	15:36	15:36	0	9376.05	9382.5	0	9	12	5	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0.191	96	42	
10050	57	0 A	8601	4	6/13/96	T WILKINS	15:45	15:45	0	2493.01	2498.72	0	6	12	5	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0.243	97	42	
10122	59	1 A	8962	5	6/13/96	PAUL LYONS	17:00	17:00	0	21534.13	21445.7	0	26	14	0	0	0	0	0	0	0	5.71	6.75	YES	38	5.71	177.0	5.71	6.75	0.234	98	43	
10090	59	0 A	368	5	5/30/96	PACINNES	15:00	15:00	0	25660.82	25664.7	0	8	5	3	2	0	0	0	0	0	11.56	15.6	NO	14	5.63	101.4	11.56	15.6	0.170	99	43	
10075	59	0 A	302	6	6/11/96	CURTIS SMITH	23:30	23:32	0	3906.59	3906.59	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.234	98	43	
10034	60	0 A	8968	6	5/31/96	T WILKINS	11:50	11:50	0	98760.05	98763.1	0	5	6	0	0	0	0	0	0	0	0	0	0	12	3.00	36.0	0	0	0.234	98	43	
10161	64	1 A	8642	6	6/21/96	T WILKINS	14:20	14:20	0	3559.21	3554.14	1	9	5	0	0	0	0	0	0	0	4.93	6.3	NO	28	6.07	121.4	4.93	6.3	0.234	98	43	
10034	66	0 D	299	4	5/29/96	T WILKINS	14:09	14:10	0	9756.39	9738.18	0	25	32	3	2	0	0	0	0	0	16.4	16.35	YES	66	16.40	1082.4	16.4	16.35	0.234	98	43	
10128	66	1 D	314	5	6/6/96	PAUL LYONS	19:10	19:14	0	26678.16	26684	0	8	16	1	4	0	0	0	0	0	5.79	6.45	YES	92	5.79	532.7	5.79	6.45	0.234	98	43	
10105	66	1 D	314	5	6/12/96	CURTIS SMITH	7:41	7:50	0	8973.25	8973.6	0	8	25	0	0	0	0	0	0	0	1.8	6	NO	38	5.78	219.6	1.8	6	0.234	98	43	
10167	69	1 C	87	4	6/12/96	PAUL LYONS	13:40	13:40	0	15072.99	15079.1	0	9	11	1	0	0	0	0	0	0	2.4	4.8	NO	23	4.62	132.6	2.4	4.8	0.234	98	43	
10092	69	0 C	397	3	7/2/96	R MATTILAINA	8:41	8:41	0	333.78	338.73	0	9	11	1	0	0	0	0	0	0	6.12	7.95	NO	21	4.95	104.0	6.12	7.95	0.234	98	43	
10108	71	1 N	8016	3	6/11/96	CURTIS SMITH	6:17	6:19	0	22331.91	22339.7	0	13	19	0	0	0	0	0	0	0												

Table B-7 (cont.)  
Trip Sample Records and Statistical Calculations: Bus and Trackless Trolley

Rec. No.	Route	Dir	Garage	Bus #	Day	Date	Surveyor	SchTime	ActTime	Rem	CashReg	CashEnd	BillAd	CashAd	Trans	Short	A free	N free	Fare Box	FB Est	FB OK	PAXI	Used	FB Cor	Calc. of Fare	Evation	Av. FB #	OK	
10118	80	I	C	13	6	6/21/96	T WILKINS	20:30	20:30	0	5029.36	5032.86	0	5	4	0	0	1	1	3.5	3.3	YES	11	3.50	38.5	3.3	0.376	127	60
10153	83.1	I	S	66	5	6/20/96	CURTIS SMITH	17:30	17:30	0	2370.85	2374.7	0	9	4	1	1	0	0	3.8	5.85	NO	15	5.63	84.5	3.5	0.376	128	60
10062	85	O	C	8015	6	5/31/96	KEN TERRELL	11:00	11:03	0	1260.54	1261.1	0	1	3	0	0	0	0	11.54	0.6	NO	4	0.58	2.3		0.144	129	60
10011	85	I	S	8015	6	5/31/96	KEN TERRELL	11:20	11:20	0	1261.08	0	0	6	2	0	0	0	0	-1261.1	3.6	NO	8	0.72	27.7		0.433	130	60
10010	85	I	S	8015	6	5/31/96	KEN TERRELL	12:05	12:05	0	0	1260.7	0	1	3	1	0	0	0	1260.7	0.75	NO	5	0.72	3.6		0.144	131	60
10141	87.2	I	S	61	3	6/11/96	T R ENGEL	20:50	20:50	0	1702.42	1703.6	0	20	32	6	1	0	0	12.67	12.67	YES	59	12.16	717.4	12.16	0.206	132	61
10048	88	O	L	60	4	6/15/96	T WILKINS	8:38	8:38	0	1702.42	1703.6	0	8	6	2	2	0	0	5.5	5.25	YES	17	5.50	93.5	5.5	0.324	133	62
10123	90	I	C	399	4	6/12/96	T WILKINS	19:30	19:30	0	1921.75	1921.1	0	8	6	2	2	0	0	3.3	5.7	NO	18	5.49	98.8	6.15	0.305	134	62
10113	90	I	C	8481	5	5/30/96	L SULLIVAN	8:05	8:05	0	1540.51	1541.5	0	21	8	1	0	0	0	6	6.15	YES	33	6.00	198.0	6	0.182	135	63
10046	92.3	O	C	116	5	5/30/96	KEN TERRELL	7:40	7:40	0	1516.44	1517.8	0	14	28	0	0	0	0	8.4	8.4	YES	42	8.40	352.8	8.4	0.200	137	65
10061	92.3	O	C	67	6	6/7/96	T WILKINS	17:10	17:02	0	5932.06	5940.46	0	14	28	0	2	1	0	3.3	3	YES	21	3.30	69.3	3.3	0.157	138	66
10060	93.1	I	C	339	5	5/30/96	T PINAKAS	14:30	14:30	0	3652.4	3655.7	0	14	9	6	2	0	0	9.9	9.9	YES	41	9.90	405.9	9.9	0.241	139	67
10017	95	O	F	8569	2	6/7/96	T WILKINS	8:38	8:38	0	4935.85	4936.1	0	14	9	6	2	0	0	1.95	1.95	YES	20	1.95	39.0	1.95	0.098	140	68
10137	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	141	68
10136	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	142	68
10135	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	143	68
10134	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	144	68
10133	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	145	68
10132	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	146	68
10131	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	147	68
10130	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	148	68
10129	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	149	68
10128	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	150	68
10127	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	151	70
10126	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	152	70
10125	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	153	71
10124	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	154	71
10123	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	155	72
10122	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	156	72
10121	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	157	72
10120	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	158	72
10119	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	159	72
10118	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	160	72
10117	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	161	72
10116	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	162	72
10115	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	163	72
10114	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	164	72
10113	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	165	72
10112	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	166	72
10111	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	167	72
10110	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	168	72
10109	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	169	72
10108	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	170	72
10107	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	171	72
10106	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	172	72
10105	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	173	72
10104	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	174	72
10103	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	175	72
10102	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	176	72
10101	95	O	F	8569	2	6/7/96	T WILKINS	17:15	17:15	0	2778.46	2778.4	0	3	16	1	0	0	0	6.14	6.14	YES	15	6.14	45.5	6.14	0.202	177	72

Table B-7 (cont.)  
Trip Sample Records and Statistical Calculations: Bus and Trackless Trolley

Rec. No.	Route	Dir.	Garage	Bus #	Day	Date	Surveyor	Sch Time	Act Time	Rem.	Cash Beg.	Cash End	Bill	Ad. Cash	Ad. Pass	Red.	St. 1/2	St. Past	Transf.	Short	A. Free	N. Free	Fare Box	FB Est.	FB OK	PAX	Used	FB Cor.	Calc. of Fare	Evation	Av. FB #	OK				
10177	23	0	D	296	7	6/15/96	T WILKINS	14:08	14:08	0	36492	36502.4	0	12	11	4	6	1	3	0	0	0	1	10.35	10.5	37	10.35	382.9	10.35	10.5	0.280	190	91			
10172	31	0	B	745	7	6/29/96	T PINAKAS	11:19	11:19	0	14321.4	14326.2	0	9	12	3	2	2	0	0	0	3	14.15	13.95	26	14.15	161.5	14.15	13.95	0.239	191	91				
10193	39.3	1	B	237	7	6/15/96	T WILKINS	20:14	20:16	0	29735.68	29739.8	0	19	23	3	1	0	6	6	3	5	14.15	13.95	35	14.15	778.3	14.15	13.95	0.257	192	92				
10187	42	1	B	251	7	6/22/96	P MACINNIES	17:57	17:57	0	1654.43	1654.43	0	5	4	1	0	1	6	6	5	5	2.22	2.4	21	2.22	100.1	2.22	2.4	0.159	194	93				
10176	42	0	B	219	7	6/22/96	P MACINNIES	17:14	17:14	0	15630	15632.2	0	2	8	0	1	1	3	3	1	1	5.62	5.1	19	4.91	93.3	5.62	5.1	0.259	195	93				
10181	43	0	D	174	7	6/29/96	T WILKINS	0:12	0:12	0	7956.33	7961.95	0	3	4	0	0	0	11	11	1	1	1.2	1.2	12	1.2	9.6	1.2	1.2	0.150	196	94				
10180	43	0	D	174	7	6/29/96	T WILKINS	23:01	23:01	0	9923.15	9924.35	0	20	28	1	4	2	0	0	1	1	7.1	13.35	56	12.86	720.1	7.1	13.35	0.230	197	94				
10188	45	1	L	8855	7	6/15/96	T PINAKAS	12:20	12:20	0	6261.5	6267.6	1	16	21	2	4	4	0	0	0	1	7.3	12.3	45	11.85	533.1	7.3	12.3	0.263	198	94				
10173	45	0	L	8855	7	6/15/96	T PINAKAS	11:30	11:30	0	6255.2	6261.5	1	21	8	4	0	2	3	3	1	1	26.64	14.1	37	13.58	502.5	26.64	14.1	0.367	199	94				
10189	45.5	1	L	8874	7	6/22/96	P MACINNIES	8:30	8:30	0	4225.89	4250.53	2	21	8	4	0	0	0	0	0	0	2.4	2.4	10	2.40	24.0	2.4	2.4	0.240	200	95				
10178	46	0	B	8648	7	6/22/96	T WILKINS	15:15	15:16	0	10932.05	10934.5	0	3	4	2	1	2	2	2	0	0	3.95	3.75	17	3.95	67.2	3.95	3.75	0.232	201	96				
10182	47	0	D	30	7	7/27/96	L SULLIVAN	7:00	7:00	0	11140.15	11144.1	0	4	8	1	2	4	0	0	0	0	6.1	9.3	38	8.96	340.4	6.1	9.3	0.236	202	96				
10186	57	1	A	8645	7	6/29/96	T PINAKAS	9:35	9:35	0	3742.3	3748.4	0	13	19	2	4	0	0	0	0	0	7.36	5	13	4.82	62.6	7.36	5	0.370	203	96				
10183	62.3	0	S	324	7	7/28/96	L SULLIVAN	17:00	17:00	0	27115.63	27122	1	5	4	4	0	3	3	6	6	6	15.85	15.9	63	15.85	998.6	15.85	15.9	0.252	204	97				
10179	66	0	D	286	7	6/15/96	T WILKINS	16:00	16:02	0	56793.06	56808.9	0	22	23	6	3	3	0	0	0	0	4.35	4.35	26	4.35	113.1	4.35	4.35	0.167	205	98				
10191	77	1	S	326	7	6/15/96	T WILKINS	18:40	18:40	0	19510.46	19514.8	0	6	16	3	1	2	0	0	0	0	12	9	35	8.67	303.4	12	9	0.248	206	98				
10185	77	1	S	8655	7	6/22/96	T PINAKAS	9:42	9:42	0	6253.7	6266.7	1	14	16	2	1	5	3	2	3	0	7.01	6.9	28	7.01	196.3	7.01	6.9	0.250	207	99				
10195	78	1	S	361	7	7/20/96	PAUL LYONS	6:40	6:40	0	6434.1	6440.1	1	7	4	4	5	3	0	0	0	0	6.74	5.85	16	5.63	90.2	6.74	5.85	0.352	208	99				
10192	88	1	S	381	7	6/29/96	T WILKINS	21:40	21:41	0	8732.19	8738.93	0	9	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000	209	100				
10190	130	1	F	381	7	6/22/96	P MACINNIES	15:45	15:45	0	16749.72	16749.7	0	0	0	0	0	0	0	0	0	0	13.95	21.25	43	20.47	880.1	13.95	21.25	0.476	210	100				
10174	435	0	L	8579	7	6/22/96	P MACINNIES	10:30	10:20	0	5984.31	5998.26	0	22	2	13	0	0	1	1	5	5	Mean	29.3	7.31	15.6	2.491	695.86	722.45	29.3	7.31	15.6	0.476	210	100	
										Sum	6163	%	0.343	0.401	0.069	0.041	0.058	0.002	0.045	0.038	0.043	0.004	Weeks	STDEV	18.8	5.60677	87.091	3.68	%	OK: 48	%					
										Sum	5940	%	0.344	0.392	0.067	0.039	0.069	0.002	0.043	0.040	0.046	0.003	Wkday	Mean	29.3	7.29553	0.2490	600.73	627.5	29.3	7.29553	0.2490	600.73	627.5	N: 172	85
										Sum	5940	%	0.344	0.392	0.067	0.039	0.069	0.002	0.043	0.040	0.046	0.003	Wkday	STDEV	19.8	5.82618	95.39	4.27	%	OK: 49	%					
										Sum	5940	%	0.344	0.392	0.067	0.039	0.069	0.002	0.043	0.040	0.046	0.003	Wkday	COV	0.7	0.7986	0.06	4.27	%	OK: 49	%					
										Sum	5940	%	0.344	0.392	0.067	0.039	0.069	0.002	0.043	0.040	0.046	0.003	Wkday	Tolerance	9.1	10.801	0.83	4.27	%	OK: 49	%					
										Sum	5940	%	0.344	0.392	0.067	0.039	0.069	0.002	0.043	0.040	0.046	0.003	Wkday	Mean	29.6	7.47	0.2528	95.13	94.950	29.6	7.47	0.2528	95.13	94.950	N: 38	16
										Sum	5940	%	0.344	0.392	0.067	0.039	0.069	0.002	0.043	0.040	0.046	0.003	Wkday	STDEV	13.5	4.5993	50.93	4.19	%	OK: 42	%					
										Sum	5940	%	0.344	0.392	0.067	0.039	0.069	0.002	0.043	0.040	0.046	0.003	Wkday	COV	0.46	0.61029	0.097	4.19	%	OK: 42	%					
										Sum	5940	%	0.344	0.392	0.067	0.039	0.069	0.002	0.043	0.040	0.046	0.003	Wkday	Tolerance	6.18	8.25434	0.827	4.19	%	OK: 42	%					

Summary	total	WK	Wk
PAX	6163	5040	1123
FB	1535.429	1254.832	283.887
Av. FB	0.2491	0.2490	0.2528
Precision	10.41949	12.0506	19.0769

**Table B-8**  
**Statistical Calculations of Weekly Passenger Boardings, True Average Fare and Average Pass Ride Value by Mode**

	BUS	TROLLEY	Bus & Trackless Trolley	Surf. GL	Subw. GL	Rapid Transit	TOT. RAIL	Pass
Jul-95	1,955,915	56,230	2,012,145	606,472	1,392,390	3,356,137	4,748,527	4,839,958.00
Aug-95	2,007,230	67,488	2,074,718	617,303	1,271,503	3,515,948	4,787,451	4,869,189.00
Sep-95	1,875,032	58,714	1,933,746	672,032	1,454,625	3,293,569	4,748,194	5,115,013.50
Oct-95	1,963,325	97,812	2,061,137	643,759	1,405,423	3,265,544	4,670,967	5,447,423.00
Nov-95	1,787,038	52,476	1,839,514	524,101	1,253,937	3,052,299	4,306,236	5,474,505.00
Dec-95	1,845,111	60,381	1,905,492	494,778	1,187,946	2,967,312	4,155,258	5,222,718.00
Jan-96	2,079,789	57,217	2,137,006	533,244	1,255,669	3,168,354	4,424,023	5,062,982.13
Feb-96	1,840,791	60,237	1,901,028	631,989	1,134,193	2,837,334	3,971,527	5,486,593.06
Mar-96	1,927,036	58,680	1,985,716	542,886	1,207,229	3,042,952	4,250,181	5,424,205.07
Apr-96	1,961,192	59,538	2,020,730	539,541	1,360,729	3,157,383	4,518,112	5,435,707.90
May-96	1,919,484	68,712	1,988,196	565,158	1,304,955	3,214,066	4,519,021	5,031,448.00
Jun-96	1,836,771	69,886	1,906,657	505,248	1,328,903	3,291,508	4,620,411	5,030,352.00
SUM of Revenue	22,998,714	767,371	23,766,085	6,876,511	15,557,502	38,162,406		
Token Revenue			241,379	2,175,600		36,859,620		
Total FB Revenue			24,007,464	9,052,111	14,443,310	30,316,703		
Pass Revenue			18,901,230	9,326,057				

	Bus & Trackless Trolley	Surf. GL	Subw. GL	Rapid Transit	Light Rail	Heavy Rail
Avg. FB Deposit unweighted weighted	0.2491	0.322	0.533	0.458 0.478 0.477		
Subw. GL/RT Split			0.783042621	0.216957379		
PAX	1,853,128	539,995	521,178	1,546,459 2,064,196 2,067,637	948,099	1,659,533
unweighted weighted						
True Av. Fare	0.4453				0.602	0.815
Av. Pass Fare	0.4891				0.691	0.828

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## Appendix C: Further Statistical Issues

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### POSSIBLE SOURCES OF BIAS

Every statistical analysis has to deal with bias caused by random and/or systematic errors. There are several sources of errors possible:

Sampling Errors: It is possible that the sample does not reflect the population, resulting in differences of sample and population characteristics. Sampling errors can occur if:

- the sample size is too small for catching the variation of the population
- the population has cluster characteristics, but is not accordingly sampled
- the stratification process has problems
- checkers introduce a trip and/or car selection bias, which can happen in the case of the Green Line

Surveying Errors: Both revenue and passenger count data can be inaccurate for reasons described above. Revenue data can be under as well as overestimated, because of measurement error or real fare evasion, whereas passenger figures just tend to be undercounted.

Analysis Errors: Assumptions (such as for weighting weekday and weekend results for the total week figure) can be not exact enough, or expansion factors based on internal ridership estimations can be inaccurate because of sampling and/or surveying errors.

### FUTURE IMPROVEMENTS FOR SAMPLING AND SURVEYING

1. The following sampling improvements are possible:

- The sample of rapid transit stations should be stratified by light and heavy rail stations, low and high volume, as well as weekday and weekend.
- Surveying the surface Green Line outbound should always start at Kenmore station and the sample should be stratified by time (no increased density within certain time periods). Car selection bias can be reduced with teams of four and trip selection bias can be controlled through better supervision.
- The sample size should be increased for the weekend.
- Zoned buses, express buses, trolleys and local buses should be stratified.

2. The following surveying improvements are possible:

- All bus and surface Green line survey forms should have a separate field for passengers paying with tokens.
- There should be different forms for each Green line branch, not only for the D-Line (because surveyors are not used to it and take regular forms for surveying the D-line).
- Reservoir and Lechmere trips must better sampled (i.e. through supervision).
- The time period of surveying rapid transit stations has to be exactly followed (because of internal expansion) and controlled through better supervision. However, it is enough to survey only a 1/2 hour time period.



